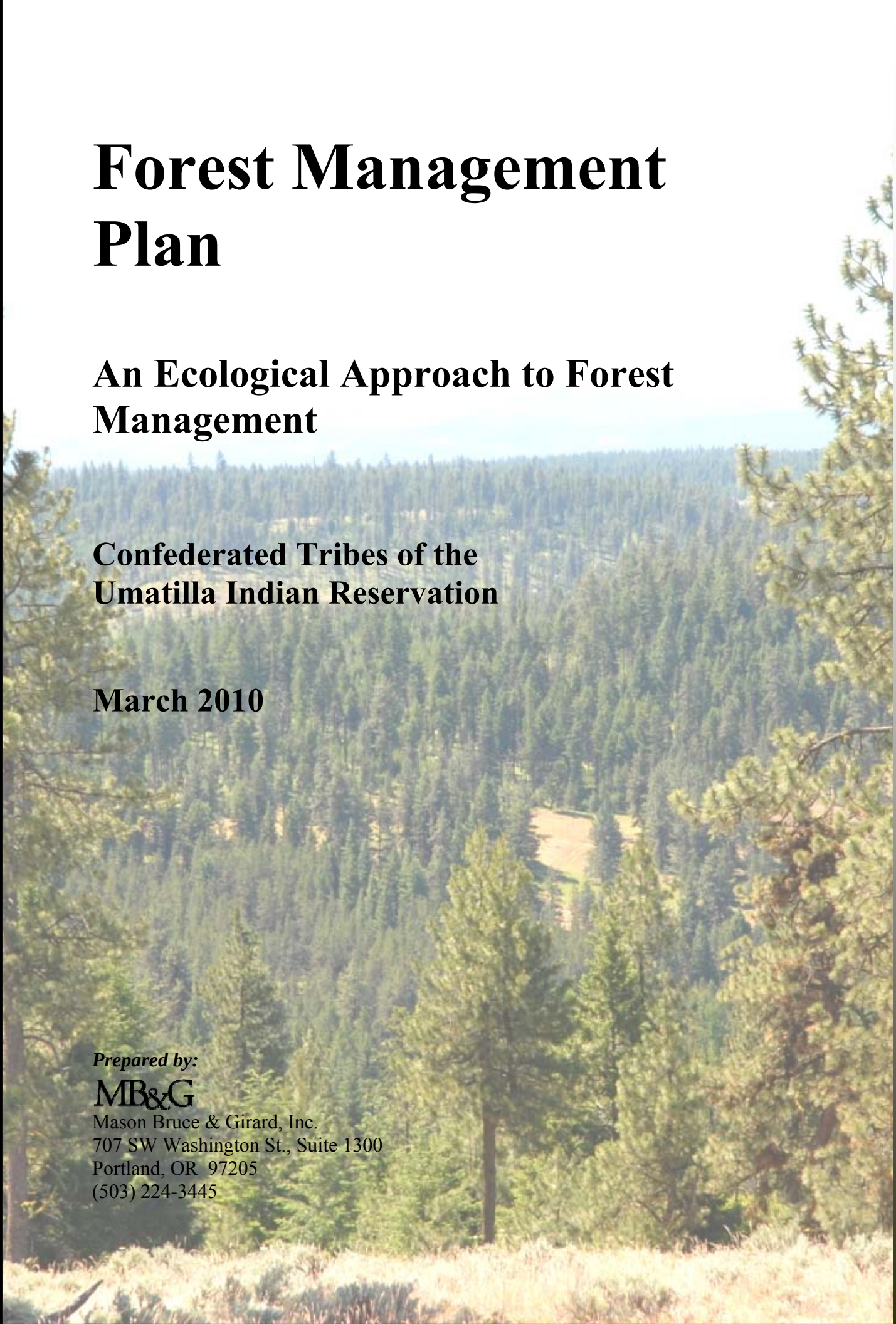
Forest Management Plan

An Ecological Approach to Forest Management

Confederated Tribes of the Umatilla Indian Reservation

March 2010



Prepared by:

MB&G

Mason Bruce & Girard, Inc.
707 SW Washington St., Suite 1300
Portland, OR 97205
(503) 224-3445

Umatilla Indian Reservation, Umatilla County, Oregon

Bureau of Indian Affairs

[This page left intentionally blank]

UMATILLA INDIAN RESERVATION
FOREST MANAGEMENT PLAN

APPROVED BY:

Eleanor H Patawa — 5-28-10

CHAIRMAN, BOARD OF TRUSTEES
CONFEDERATED TRIBES OF THE
UMATILLA INDIAN RESERVATION

DATE

Jerry L Lauer — 6-2-10

SUPERINTENDENT, UMATILLA AGENCY
BUREAU OF INDIAN AFFAIRS

DATE

6/8/10

REGIONAL DIRECTOR, NORTHWEST REGION
BUREAU OF INDIAN AFFAIRS

DATE

[This page left intentionally blank]

CERTIFICATE

The undersigned, Elwood H. Patawa and N. Kathryn Brigham, hereby certify that they are the Chairman and Secretary, respectively, of the Board of Trustees of the Confederated Tribes of the Umatilla Indian Reservation, and at a regular meeting of said Board at the Board Room of the Nixyaawii Governance Center, Mission, Oregon, on the 22nd day of March, 2010, a quorum of said Board was present and the following Resolution was regularly moved, seconded, and adopted by a vote of 5 for, 0 against, and 0 abstaining.

RESOLUTION

WHEREAS, the Board of Trustees is the governing body of the Confederated Tribes of the Umatilla Indian Reservation (Confederated Tribes) by the authority of Article VI, Section 1 of the Constitution and Bylaws of the Confederated Tribes, adopted on November 4, 1949 and approved on December 7, 1949, as amended; **AND**

WHEREAS, pursuant to Article VI, Section 1(a) of the Constitution and Bylaws, the powers of the Board of Trustees include the authority "to represent the Tribes and to negotiate with Federal, State and local governments"; **AND**

WHEREAS, pursuant to Article VI, Section 1(b) of the Constitution and Bylaws, the powers of the Board of Trustees include the authority "to manage all affairs of the Confederated Tribes, including the administration of tribal lands, funds, timber and other resources"; **AND**

WHEREAS, a Forest Management Plan is required under 25 USC § 3101 et seq, in order to undertake forestry management activities on lands held in trust by the United States for a tribe or tribal members; **AND**

WHEREAS, in Resolution No. 00-08, January 31, 2000, the Board of Trustees identified the preparation of a Forest Management Plan (FMP) as a priority in order to perpetuate "water quality, fish and wildlife habitat, traditional foods and medicines, timber production, and other uses for the long term benefit of the Confederated Tribes"; **AND**

WHEREAS, also in Resolution No. 00-08, the Board of Trustees directed that an Interdisciplinary Team (IDT) be created to develop the environmental review of the project, comprised of staff from the Bureau of Indian Affairs (BIA), Department of Natural Resources (DNR), and the Tribal Planning Office (TPO); **AND**

WHEREAS, the Board of Trustees acknowledged the desire to apply the Forest Management Plan across all lands within the Umatilla Indian Reservation, however the plan was only written for the tribal trust, allotted trust and tribal fee lands on the reservation because the FMP is a federally funded plan and the BIA has no authority to exercise over private lands on the reservation; **AND**

WHEREAS, pursuant to BIA regulations, the FMP may remain in effect until found to be inconsistent with Tribal goals, forest management policy, or the condition of the forest and shall be formally reviewed for consistency not less than once every 15 years; **AND**

WHEREAS, Resolution No. 06-033 stated "The Interdisciplinary Team (IDT), established for the purpose of overseeing the development of the FMP, met for three years developing the GIS layers, goals, objectives, standards and guidelines as well as conducting public comment sessions on the alternatives and selected a preferred alternative that was approved by the Board of Trustees at a work session in 2004"; **AND**

WHEREAS, the Environmental Assessment (EA, attached as Exhibit 1) and FMP (attached as Exhibit 2) have been completed by the contractor, BIA and DNR and were presented to the Board of Trustees on March 19, 2010; **AND**

WHEREAS, the Environmental Assessment was reviewed by the following committees/commissions:

Tribal Water Commission on (December 2, 2008)
Cultural Resources Committee (December 2, 2008)
Economic and Community Development Committee (December 3, 2008)
Fish and Wildlife Commission (December 9, 2008)
Natural Resources Commission (December 23, 2008)
Land Acquisition Committee (January 6, 2009); **AND**

WHEREAS, upon completion of the public review of the Environmental Assessment, DNR, BIA and contractor assembled the FMP based on the public comments which was then made available publically for review in June, 2009; DNR and BIA participated in a Special General Council meeting on July 9, 2009 and received comments from tribal programs and departments, which have been integrated into the EA and FMP; **AND**

WHEREAS, the Board of Trustees supports the application of the standards adopted in this FMP to govern all forestry related activities on trust and tribal fee lands on the reservation; **AND**

WHEREAS, the Board of Trustees supports staff continuing to work on integrating these standards into the Land Development Code including amendment of the Forest Practices Act; **NOW, THEREFORE, BE IT**

RESOLVED, that the Board of Trustees approves the attached Environmental Assessment and Forest Management Plan as developed jointly by the BIA and DNR through the Interdisciplinary Team; **AND BE IT FURTHER**

RESOLVED, that within one year of the adoption of this resolution (and thereafter as directed by the Board), staff of the BIA and DNR shall conduct a work session to review the implementation of the FMP**; AND BE IT FURTHER**

RESOLVED that at least every ten years staff of the BIA and DNR shall review with the Board of Trustees the question of whether the FMP remains consistent with Tribal goals, forest management policy and the condition of the forest

RESOLVED, that the Board of Trustees directs staff in the Tribal Planning Office to begin the process to amend the Land Development Code by incorporating the standards contained in the FMP into the Forest Practices Manual to apply to all Reservation lands; **AND BE IT FINALLY**

RESOLVED, that the Board of Trustees authorizes the Chairman, the Director of the Department of Natural Resources and other relevant staff to sign the necessary documents for the BIA to execute the FMP.

AND, that said Resolution has not been modified amended or repealed and is still in full force and effect.

DATED this 22nd day of March, 2010.

Elwood H. Patawa, Chairman
Board of Trustees

A T T E S T :

for N. Kathryn Brigham, Secretary
Board of Trustees

Exhibit 1: **Forest Management Plan Environmental Assessment**
Exhibit 2: **Forest Management Plan**

[This page left intentionally blank]

EXECUTIVE SUMMARY

Introduction

The Umatilla Indian Reservation (UIR) established by the Treaty of June 9, 1855, 12 Statue 945, between the United States and the Cayuse, Umatilla and Walla Walla Tribes lies along the foothills of the Blue Mountains in northeastern Oregon immediately east of Pendleton. The UIR covers a variety of terrain and land uses including rough uneven forests and rangelands, gently sloping agricultural fields, and long narrow floodplains supporting dense riparian vegetation.

In order to comply with provisions of the National Indian Forest Management Act of 1990, Title 25 U.S.C. § 3101-3120, the Bureau of Indian Affairs (BIA) and the Confederated Tribes of the Umatilla Indian Reservation (CTUIR) must develop and implement a Forest Management Plan for the UIR. No management activities on forest lands held in trust by the United States for an individual Indian or the CTUIR can be undertaken by the BIA and/or the CTUIR under the Indian Self-Determination and Education Assistance Act of 1975 as amended, Title 25 U.S.C. § 450 *et seq.* or § 458 *et seq.*, until a Forest Management Plan is completed.

Purpose and Need

Fire occurred relatively frequently in the Blue Mountains and was a major disturbance process in determining the historic range of variability in forest composition and structure. Systematic attempts to exclude fire from forest ecosystems began early in the 20th century. Fire exclusion has created dense, multi-storied tree stands of uniform age. Along with fire suppression, past logging practices that favored the harvest of commercially valuable ponderosa pine have led to an increase in the proportion of shade tolerant tree species. The stands are now more susceptible to mortality due to drought and insects or diseases.

The National Indian Forest Management Act of 1990 mandates that land management activities undertaken on Indian trust forest lands achieve the following objectives:

1. The development, maintenance, and enhancement of Indian forest land in a perpetually productive state in accordance with the principles of sustained yield and with standards and objectives set forth in forest management plans by providing effective management and protection through the application of sound silvicultural and economic principles.

2. The regulation of Indian forest lands through the development and implementation, with the full and active consultation and participation of the appropriate Indian tribe, of forest management plans which are supported by written tribal objectives and forest marketing programs.

3. The retention of Indian forest land in a natural state when an Indian tribe determines that the recreational, cultural, aesthetic or traditional values of the Indian forest land represents the highest and best use of the land.

4. The management and protection of forest resources to retain the beneficial effects to Indian forest lands of regulating water run-off and minimizing soil erosion.

5. The maintenance and improvement of timber productivity, grazing, wildlife, fisheries, recreation, aesthetic, cultural and other traditional values.

The CTUIR depend on natural resources to develop a strong diversified economy while preserving cultural, subsistence and aesthetic values. Fishing and hunting, as well as the gathering of roots and berries, are deeply rooted within the Tribal social structure. The harvesting, processing, manufacturing and marketing of farm, forest, livestock, and mineral products provide income to landowners and the Tribes. Together with the Wildhorse Casino and Resort, use of natural resources form the foundation of the economy of the UIR at the present time. The development of the Coyote Business Park will further diversify the economy of the UIR in the future.

Key Issues and Concerns

An Interdisciplinary Team (IDT) comprised of BIA and CTUIR natural resource management staff met with the Board of Trustees and the Natural Resources Commission of the CTUIR to identify key issues and concerns that should be addressed in the Forest Management Plan. In addition, the IDT contacted all members of the CTUIR inviting participation from individuals interested in, or potentially affected by, development of a Forest Management Plan.

As a result of these efforts, the IDT identified issues and concerns associated with the following categories as significant to the development of a Forest management Plan:

1. Water Quality/Instream Fisheries Habitat
2. Forest Composition/Timber Production
3. Fire Management
4. Wildlife/Wildlife Habitat
5. Threatened and/or Endangered Fish, Wildlife, and Plants
6. Cultural Resources/Traditional Uses
7. Transportation System
8. Air Quality
9. Implementation Costs

Management Direction

The CTUIR Department of Natural Resources (DNR) has adopted a mission statement based on "*First Foods"* ritualistically served in a Tribal meal. Listed in the order in which they are served, *First Foods* include: water, salmon, deer, cous, and huckleberry. The CTUIR DNR considers *First Foods* to constitute the minimum ecological products necessary to sustain the CTUIR culture. The CTUIR DNR expects that in applying this paradigm, land managers can focus on appropriate ecological processes that provide and sustain *First Foods*.

The IDT used a three-step process to formulate a management strategy for the Forest Management Plan. The IDT first established goals and objectives for management of forest resources on the UIR that incorporate the *First Foods* paradigm and respond to key issues and concerns. The IDT then identified the standards or the physical, biological, and social conditions necessary for any alternative to meet the goals and objectives. Finally, the IDT formulated an alternative for change in management that reasonably could be expected to meet the goals and objectives, if fully funded and implemented. In formulating this management alternative, the IDT considered the effects that vegetation management may have on Tribal culture and natural resource values.

After careful review of the issues and concerns and the options available for management for forests of the UIR, the BIA and CTUIR selected the forest management direction based on the following criteria:

1. The management strategy must comply with provisions of the Comprehensive Plan, Columbia Basin Salmon Policy, Water Code, Total Maximum Daily Load, and Water Quality Management Plan.

2. The management strategy must balance the cultural, social, economic, and environmental values of the CTUIR.

3. The management strategy must promote forest health and sustainable forest ecosystems.

4. The management strategy must protect threatened or endangered species (summer steelhead, spring chinook, and bull trout) habitat and protect important deer and elk security habitat.

5. The management strategy must provide a reasonable opportunity to achieve the goals and objectives identified during the planning process.

6. The management strategy must preserve options for change in management activities if monitoring reveals that the goals and objectives are not being achieved.

The BIA and CTUIR will emphasize improving forest health and reducing fuel accumulations, including the reintroduction of fire, while maintaining a variety of structural stages, particularly late and old stages, on all forested areas of the UIR. The BIA and CTUIR will also emphasize maintenance and enhancement of plant and animal diversity in terms of species composition, distribution, and arrangement. The BIA and CTUIR will use the creation and maintenance of

structurally complex stands as the primary approach to managing forests for multiple, complex objectives including the production of wood products.

In the dry forest, there will be a moderate abundance and persistence of mature forest, dominated by stands resistant to low severity fires. The most common species will be ponderosa pine and western larch, with a moderate component of Douglas-fir and a minor component of grand fir.

In the moist forest, there will be a moderate abundance and persistence of young forests consisting of ponderosa pine, western larch, Douglas-fir, and lodgepole pine with a minor component of grand fir. In order to achieve this objective, it will be necessary to apply small group selection cuts (up to five acres). There will also be a moderate persistence and abundance of old forests consisting of Douglas-fir and grand fir.

The BIA and CTUIR will manage stand density to maintain high stand vigor. No silvicultural approach can contribute as much to forest health as stand density management. Thinning and other density management treatments, such as hazardous fuels reduction, are an effective way to apply integrated pest management that involves the use of silvicultural measures to reduce susceptibility, or vulnerability, to wildland fire, insects, diseases, parasites, and other harmful agents.

The BIA and CTUIR will use guidelines established for forest stands in northeastern Oregon to determine appropriate thinning strategies. Trees will be selected for harvest in managed stands across all age classes to bring the stand density index (SDI) to between values established for the upper and lower limits of the management zone. These SDI values are available for each species in each plant association found on the UIR. Prescribed fire and mechanical hazardous fuels reduction projects will be used to reduce the buildup of fuels.

Portions of the Big Johnson Creek and Isqúulktpe Creek Subwatersheds will be designated as Special Management Areas. The BIA and CTUIR will not construct new roads in these drainages to treat timber stands. Therefore, due to the economics of helicopter logging, not as many forest stands in these drainages will likely be managed. By maintaining portions of Big Johnson Creek and Isqúulktpe Creek as Special Management Areas, increased protection of core wildlife and fisheries habitat areas will be provided.

The BIA and CTUIR will use management regimes directed toward establishment of multiple cohorts. In fire prone forests, maintenance of a large diameter cohort satisfies wildlife and fire resiliency objectives while managing small and medium diameter components for wood production and reduction of catastrophic fire potential. Definition of the large diameter objective varies with site productivity--a range might be 25 to 40 inches DBH. The management regimes are:

NSH Under this regime, timber harvest will not be scheduled (No Scheduled Harvest) in the inner 50% of the riparian management zones. These stands will be examined on a case-by-case basis to determine if their condition warrants vegetation treatment to achieve riparian management objectives.

CC The Clearcut Regime will be assigned to lodgepole pine stands. These stands generally do not lend themselves to multi-cohort management. Rotation length will be 60-80 years.

ML20 This Multi-Cohort Regime focuses on producing larger trees and fewer small trees than MS20. Harvests are scheduled to occur every 20 years generally focusing on larger age classes. Foresters often use a "Q-Factor" to describe stand structure under uneven-aged management. The Q-Factor describes the number of trees in a size class relative to the next larger size class. Two inch classes are used to describe the structure. ML20 has a stand structure defined with a Q-Factor of 1.12. Trees are distributed between age classes such that the smaller size classes have just enough trees to grow into larger age classes.

The resulting stands should be more resistant to stand replacing fire. A moderate intensity ground fire could reduce stocking in smaller size classes to the point where there would not be enough trees in the smaller classes to replace trees in the larger classes. These stands may also be somewhat more susceptible to insects or diseases that target larger trees. Stands managed under this regime will have an open and park-like appearance dominated by larger trees.

MS20 This Multi-Cohort Regime stores more of the biomass in smaller trees. Harvests are also scheduled to occur every 20 years generally focusing on smaller diameter trees. MS20 has a stand structure defined by a Q-Factor of 1.3.

The BIA and CTUIR will also seek opportunities in stands that have not reached commercial size, on both allotted and Tribal lands, to implement a thinning program designed to improve forest health. In this program, shade intolerant species will be favored over shade tolerant species. Thinning costs approach $250 per acre.

The BIA and CTUIR will develop a fire management capability to use prescribed fire and mechanical fuel reduction methods as a means of reducing stocking levels and fuel loads. The BIA and CTUIR anticipate that as trained personnel become available and with apparent increased emphasis at the national level on reducing the potential for large scale-high severity catastrophic wildfires, prescribed fire use will increase on the UIR, combining the need to reduce fuel loads with other wildlife habitat improvements or restoration of native plant communities. Between 300 to 500 acres could be treated each year once the capability is in place. Costs for mechanical fuel treatments range from $600 to $1,000 per acre. Costs for prescribed fire (underburning) range from $300 to $500 per acre for the first entry and $50 to $120 per acre for subsequent entries. Activity fuel treatment costs range from $100 to $200 per acre.

Table ES-1 compares the number of acres available for vegetation management to the number actually being scheduled for management, by sub-watershed, under this Forest Management Plan. Available acres exclude private lands as well as floodplain and inner riparian areas where no scheduled timber harvest is allowed. Fewer acres are being managed than are available due to the application of economic criteria (maximizing net present value) when scheduling acres for treatment. For the most part, it is within the Isqúulktpe Creek and Big Johnson Creek Special Management Areas where most of the available acres not scheduled for management occur. Helicopter logging within roadless areas incurs significantly higher costs--$400/MBF for helicopter logging compared to $150-$180/MBF using ground based systems.

Table ES-1. Forested Acres Available For Management And Acres Scheduled Or Selected For Management By Sub-Watershed And Ownership Class.

HUC No.	Name	Available Acres by Ownership				Managed Acres by Ownership			
		Allotted Trust	Tribal Trust	Tribal Fee	Total	Allotted Trust	Tribal Trust	Tribal Fee	Total
3	Eagle Creek	500	0	60	560	500	0	60	560
6	Upper Spring Hollow	136	0	0	136	136	0	0	136
11	North Umatilla River	107	11	0	118	107	11	0	118
13	Saddle Hollow	22	2	0	24	22	2	0	24
16	Upper Umatilla River	121	0	0	121	121	0	0	121
23	Lower Meacham Creek	133	0	5	138	133	0	2	135
28	Red Elk Canyon	30	0	0	30	30	0	0	30
31	Buckaroo Creek	798	138	523	1,459	798	138	508	1,444
32	Meacham Creek	179	31	528	737	179	31	492	701
33	Boston Canyon	106	0	33	139	106	0	17	123
36	Coonskin Creek	122	25	0	147	122	25	0	147
42	Cottonwood Creek	178	0	33	211	178	0	33	211
51	Red Hawk Gulch	41	0	0	41	41	0	0	41
52	Upper North Coyote Creek	8	0	0	8	8	0	0	8
53	Isqúulktpe Creek	426	369	379	1174	306	121	25	452
54	Little Isqúulktpe Creek	213	128	58	399	111	81	0	192
55	Deadman Pass Canyon	602	182	223	1,007	602	182	219	1,003
56	Lost Pin Creek	334	30	168	532	334	30	158	523
58	Darr Creek	0	40	0	40	0	40	0	40
59	Upper Meacham Creek	0	146	0	146	0	146	0	146
63	Little McKay Creek	27	0	0	27	27	0	0	27
66	Denson Canyon	6	0	0	6	6	0	0	6
68	Beaver Creek	0	377	0	377	0	377	0	377
71	McKay Creek	0	1,430	0	1,430	0	1,430	0	1,430
72	Wood Hollow	0	19	0	19	0	19	0	19
73	Bassey Creek	0	147	0	147	0	147	0	147
74	Snipe Creek	0	65	0	65	0	65	0	65
75	Little Johnson Creek	0	934	0	934	0	934	0	934
76	Johnson Creek	0	2,005	0	2,005	0	1,102	0	1,102
77	East Birch Creek	0	215	0	215	0	215	0	215
78	Jenning's Creek	0	2,100	0	2,100	0	2,100	0	2,100
79	McCoy Creek	0	309	0	309	0	309	0	309
81	Wild Horse Mountain	186	18	0	204	186	18	0	204
83	Bachelor Canyon	899	24	772	1,695	481	13	309	804
87	Moonshine Creek	395	0	28	423	395	0	28	423
88	Bell Cow Creek	0	74	0	74	0	74	0	74
89	Table Rock	55	3	72	130	55	3	72	130
90	Red Spring	0	18	0	18	0	18	0	18
92	Mainstem Umatilla River	89	0	0	89	89	0	0	89
94	Mission Creek	121	15	0	136	121	15	0	136
Total		5,834	8,855	2,882	17,570	5,194	7,646	1,923	14,765

Table ES-2 displays acres scheduled for treatment by land ownership class in the first two decades of the plan while Table ES-3 displays volume offered for harvest by treatment type by ownership class for the same period. Notice that the annual allowable cut (AAC) increases from 1.54 MMBF/year in decade one to 1.85 MMBF/year in the second decade.

The suggested SDI stocking levels delineate a management zone in which stand densities are presumed to be relatively resistant to insect and disease problems and at a relatively low risk for large scale-high severity wildland fires. The total number of acres in forest stands above SDI guidelines increases initially from 6,289 acres at present to 9,154 in 50 years but then decreases to 5,158 in 120 years (Table ES-4). At the end of the planning period, all forest acres above SDI guidelines are within unmanaged stands.

In order to fulfill the federal government's responsibility for management of Indian trust resources, the BIA provides a significant portion of the costs of forest management. Using a conservative constant stumpage value of $150 per MBF, revenues to be distributed to the beneficial owners should increase by almost 95 percent over the next five decades (Table ES–5). Actual stumpage values should be somewhat higher if the regional and national housing markets recover from their current depressed levels.

Table ES-2. Estimated Acres Of Vegetation Treatment By Treatment Type In Decade 1 And Decade 2.

Ownership Class	Acres Treated in Decade 1			Acres Treated in Decade 2		
	Thin	Clearcut	Total	Thin	Clearcut	Total
Allotted Trust	1,636	0	1,636	1,757	0	1,757
Tribal Trust	2,647	117	2,764	2,258	0	2,258
Tribal Fee	482	0	482	540	0	540
Total	4,765	117	4,882	4,555	0	4,555

Table ES-3. Decadal Harvest Volumes In Million Board Feet Per Decade.

Ownership Class	Volume Harvested in Decade 1			Volume Harvested in Decade 2		
	Thin	Clearcut	Total	Thin	Clearcut	Total
Allotted Trust	6.5	0	6.5	8.7	0	8.7
Tribal Trust	6.8	0.5	7.3	7.8	0	7.8
Tribal Fee	1.6	0	1.6	2.0	0	2.0
Total	14.9	0.5	15.4	18.5	0	18.5

Table ES-4. Total Number Of Forest Acres Above SDI Guidelines By Decade.

Decade	1	2	3	4	5	6	7	8	9	10	11	12
Acres	6,289	9,284	7,744	8,304	9,154	9,012	8,732	7,266	6,533	5,367	5,175	5,158

Table ES-5. Decadal Revenue To Be Distributed To Landowners By Ownership.

Decade	1	2	3	4	5
Allotted Trust	$ 97,500	$ 130,500	$ 126,000	$ 145,500	$ 159,000
Tribal Trust	$ 109,500	$ 117,000	$ 150,000	$ 186,000	$ 240,000
Tribal Fee	$ 24,000	$ 30,000	$ 36,000	$ 42,000	$ 51,000
Total	$ 231,100	$ 277,500	$ 312,000	$ 373,500	$ 450,000

TABLE OF CONTENTS

CHAPTER IV - IMPLEMENTATION OF THE FOREST MANAGEMENT PLAN 103

Tables and Figures

List of Tables

List of Figures

ABBREVIATIONS

AAC	Annual Allowable Cut
ACOE	Army Corps of Engineers
AMR	Appropriate Management Response
A/O/C	Activities, Outputs, and Conditions
ARPA	Archeological Resources Protection Act of 1979
BA	Basal Area per acre
BAER	Burned Area Emergency Response and Rehabilitation Program
BF	Board Feet
BIA	Bureau of Indian Affairs
BIAM	Bureau of Indian Affairs Manual
BLM	Bureau of Land Management
BMP	Best Management Practices
CAA	Clean Air Act
CC	Clearcut
CCC	Calculated Canopy Cover
CCF	Crown Competition Factor
CE	Categorical Exclusion
CFI	Continuous Forest Inventory
CFR	Code of Federal Regulations
CTUIR	Confederated Tribes of the Umatilla Indian Reservation
CRPP	Cultural Resources Protection Program
CWA	Clean Water Act
CWPP	Community Wildland Protection Plan
DBH	Diameter at Breast Height
DECD	Department of Economic and Community Development
DIB	Diameter Inside Bark
DNR	Department of Natural Resources
EA	Environmental Assessment
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ERU	Ecological Reporting Unit
ESA	Endangered Species Act
ESU	Evolutionarily Significant Unit
FBFM	Fire Behavior Fuel Models
FMP	Forest Management Plan

FMU	Fire Management Units
FONSI	Finding of No Significant Impact
FOR	Forest Officer's Report
FPA	Fire Program Analysis System
HUC	Hydrologic Unit Code
IAM	Indian Affairs Manual
ICBEMP	Interior Columbia Basin Ecosystem Management Plan
IDT	Interdisciplinary Team
IWM	Integrated Weed Management
MBF	Thousand Board Feet
MMBF	Million Board Feet
MSL	Mean Sea Level
NAGPRA	Native American Graves Protection and Repatriation Act of 1990
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act of 1969
NFPORS	National Fire Plan Operations and Reporting System
NHPA	National Historic Preservation Act of 1966
NOAA	National Oceanic and Atmospheric Administration
NPME	Natural Production Monitoring and Evaluation
NPV	Net Present Value
NSH	No Scheduled Harvest
NTU	Nephelometric Turbidity Units
NWRO	Bureau of Indian Affairs, Northwest Regional Office
ODA	Oregon Department of Agriculture
ODEQ	Oregon Department of Environmental Quality
ODF	Oregon Department of Forestry
ODFW	Oregon Department of Fish and Wildlife
PAG	Plant Association Groups
PVG	Potential Vegetation Groups
RM	River Mile
RMZ	Riparian Management Zones
SATCP	Special Allotment Timber Cutting Permit
SDI	Stand Density Index
SPS	Stand Projection System
TAAMS	Trust Asset and Accounting Management System
TERO	Tribal Employment Rights Office
THPO	Tribal Historic Preservation Office

TMDL	Total Maximum Daily Load
TPA	Trees Per Acre
TSI	Timber Stand Improvement
TSO	Timber Sale Officer
TSS	Total Suspended Solids
UIR	Umatilla Indian Reservation
USDA	United States Department of Agriculture
WFDSS	Wildland Fire Decision Support System
WFMI	Wildland Fire Management Information
WUI	Wildland Urban Interface
WMU	Wildlife Management Units
WQMP	Water Quality Management Plan

[This page left intentionally blank]

Chapter I - Introduction

Purpose and Need

The purpose for the Forest Management Plan is to enable the Confederated Tribes of the Umatilla Indian Reservation (CTUIR) and the Bureau of Indian Affairs (BIA) to manage forest communities for a variety of cultural and economic uses. The CTUIR depends upon natural resources to develop a strong diversified economy while preserving cultural, subsistence and aesthetic values. Fishing and hunting as well as the gathering of roots and berries are deeply rooted within the Tribal social structure. The harvesting, processing, manufacturing, and marketing of farm, forest, livestock, and mineral products provide income to landowners and the Tribes.

Forest health in the Blue Mountains of northeastern Oregon and southeastern Washington has been a topic of interest since the early 1990's primarily due to insect and disease epidemics (Johnson 1994). Regional drought, insect epidemics, and a buildup of fuels from the lack of periodic fire have all occurred across large portions of the Blue Mountains adjacent to the Umatilla Indian Reservation (UIR). The general health of the forests is not good. The primary factor leading to the lack of periodic fire has been the intentional exclusion of fire. Past timber management practices have also contributed to the present condition of the forest. Consequently, the CTUIR and its members, along with other Indian landowners, are interested in management actions that may diminish the potential for epidemic insect infestations and high intensity wildfire.

The Blue Mountains have a history of natural disturbances, fire, grazing/browsing by ungulates, and insect/disease epidemics important to ecosystem processes (Johnson 1994). Vegetation of the Blue Mountains is comprised of plants with reproductive mechanisms capable of withstanding severe and frequent disturbance. The long-term consequences of natural disturbances for the most part enhance biological diversity and ecosystem resilience.

When disturbances are absent for an extended period of time, instability is heightened for vegetation that normally received periodic disturbance. Under such instability, plant community composition cannot be maintained, increasing the possibility for a catastrophic event to occur. Passive management may not be the best choice to restore degraded ecosystems.

Estimates of growth and mortality for forest stands of the UIR have been developed based on data from 306 Continuous Forest Inventory (CFI) plots originally established and measured in 1990 and re-measured in 2003 (Fairweather 2009). Annual net growth was quite low from 1990 to 2003 averaging only 2 board feet per acre per year over all species. Ponderosa pine (*Pinus ponderosa*) grew the fastest at approximately 47 net board feet per acre per year but this growth was offset by a negative net growth of approximately 44 board feet per acre per year in grand fir (*Abies grandis*). The extremely low annual net growth rate occurred essentially in the absence of significant harvest. This low net growth rate reflects forest health concerns including low tree vigor and increased susceptibility to insect and disease outbreaks.

Process for the Development of the Forest Management Plan

The Interdisciplinary Team (IDT) used a three-step process to identify strategies for management of forest resources that responds to the issues and concerns identified during the planning process. The IDT first established goals and objectives for management of forest resources on the UIR and then identified the standards or the physical, biological, and social conditions necessary for any alternative to meet the goals and objectives. Finally, the IDT formulated a strategy for change in management that reasonably could be expected to meet the goals and objectives, if fully funded and implemented. The IDT considered the effects that vegetation management may have on Tribal culture and natural resource values.

- Any management program must utilize the best methods available to manage forests depending on their ecological status, autecology of tree species, geographic location, presence of, or the need to restore, culturally significant plants or animals, fish and wildlife habitat requirements, watershed values, and legal, policy, and budget constraints.
- The management program should ensure continuous public involvement in all phases of development and implementation of activities.
- The management program must follow established procedures for analysis of forest stands including determination of ecological status and follow up monitoring that will document successes and failures.
- The management program should provide for economic sustainability, but only after the values Tribal culture places on natural resources other than timber production are considered and incorporated into management activities.
- The management program must include a process whereby it can be modified in response to changing ecosystem conditions as identified by the monitoring process.

Trust Responsibility of Federal Government

The United States government has a unique legal relationship with American Indian tribes. This relationship is founded on the Constitution of the United States and is more fully set out in treaties, federal statues, and federal court decisions. The federal government must consult with tribal governments prior to taking actions that affect federally recognized tribal governments. This relationship is committed to the protection of, and respect for, the rights of Indian self-government.

The United States, through its trust relationship with Indian tribes and individual tribal members, holds title to Indian trust land for the beneficial owners--either tribes or individuals. Therefore, the federal government has a responsibility, charge, and duty to beneficiaries of the trust. This trust relationship has been established as a result of treaties, statues, regulations, and federal

court decisions. The trust relationship between the United States and American Indians is unique by the mere fact that the United States is the trustee.

Under authority of the Indian Self-Determination and Education Assistance Act of 1975, as amended, Title 25 U.S.C. 450 *et seq.*, the CTUIR assumed responsibility for the forest management program on the UIR January 1, 2009. The only remaining inherent federal functions for forest management on trust lands are approval of the Forest Management Plan, approval of advertised or negotiated sales of forest products, approval of timber sale contracts, approval of prescribed burn plans, approval of emergency fire suppression expenditures, and delegation of authority for fire suppression activities to Incident Management Teams.

Relationship to Federal Statutes

National Indian Forest Resources Management Act; Title 25 U.S.C. § 3101-3120

The National Indian Forest Resources Management Act of 1990 mandates that land management activities undertaken by the Secretary of Interior on Indian trust lands shall be designed to achieve the following objectives:

1. The development, maintenance, and enhancement of Indian forest land in a perpetually productive state in accordance with the principles of sustained yield and with standards and objectives set forth in forest management plans by providing effective management and protection through the application of sound silvicultural and economic principles.

2. The regulation of Indian forest lands through the development and implementation, with the full and active consultation and participation of the appropriate Indian tribe, of forest management plans which are supported by written tribal objectives and forest marketing programs.

3. The retention of Indian forest land in a natural state when an Indian tribe determines that the recreational, cultural, aesthetic or traditional values of the Indian forest land represents the highest and best use of the land.

4. The management and protection of forest resources to retain the beneficial effects to Indian forest lands of regulating water run-off and minimizing soil erosion.

5. The maintenance and improvement of timber productivity, grazing, wildlife, fisheries, recreation, aesthetic, cultural and other traditional values.

In addition to the National Indian Forest Resources Management Act of 1990, there are other federal statutes that govern management of forest resources on Indian trust lands.

National Historic Preservation Act of 1966; Title 16 U.S.C. § 470 et seq.

The National Historic Preservation Act of 1966 (NHPA), as amended, protects historic and archeological properties during the planning and implementation of federal undertakings. Cultural resources must be identified during the planning phase of a project, the significance for potentially affected cultural resources based on scientific archeological value must be determined, and potentially adverse impacts on any significant sites that may be affected must be mitigated.

Pursuant to Section 101(d)(2) of the NHPA, the CTUIR assumed the responsibilities of the State Historic Preservation Office within the Umatilla Indian Reservation. All federal undertakings are reviewed by the Tribal Historic Preservation Office.

Archaeological Resources Protection Act of 1979; Title 16 U.S.C. §470aa et seq.

The Archeological Resources Protection Act of 1979 (ARPA), as amended, protects archeological resources on public and Indian lands by establishing criminal and civil penalties for unlawful excavation, removal, or destruction of such resources, and sets up permitting policies through the appropriate land manager.

Native American Graves Protection and Repatriation Act; Title 25 U.S.C. § 3000 et seq.

The Native American Graves Protection and Repatriation Act of 1990 (NAGPRA), as amended, protects Native American burials during planning and implementation of projects on federal or trust lands. In the event of a known burial, the project must address treatment of the burial in consultation with the CTUIR. In the event of an inadvertent discovery of Native American human remains, all work in the immediate vicinity of the burial must cease in order to develop a Plan of Action under NAGPRA to address treatment of the remains, in conformance with the NAGPRA regulations, Title 42 Code of Federal Regulations Part 10.1 *et seq*.

National Environmental Policy Act of 1969; Title 42 U.S.C. § 4321-4370d

The National Environmental Policy Act of 1969 (NEPA), as amended, requires that federal agencies stop and consider the potential effects of actions that might adversely affect the environment and consider possible alternative courses of action to reduce impacts before approving the project.

Federal agencies are required to prepare various reports, the most significant being an Environmental Impact Statement, or EIS, for all "major federal actions significantly affecting the quality of the human environment." Special attention must be paid to each of the words in the above phrase. Decisions must be made as to whether each action is major, is significant in its effects, and how the quality of the human environment is influenced. An EIS is an often extensive document which must describe the environmental impacts of the proposed action, the

adverse environmental impacts which cannot be avoided, the reasonable alternatives to the proposed action, the relationship between short-term uses and long-term productivity of the environment, and any irreversible commitments of resources involved in the proposed action.

Often, an Environmental Assessment (EA) is prepared to determine whether or not an EIS will be required. EA's include brief discussions of the environmental impacts of, and alternatives to, a proposed project. If an EA indicates that no significant impact will occur, then a Finding of No Significant Impact (FONSI) may be issued which presents the reasons why the action will not produce significant environmental impacts.

If an action is shown to cause great harm to the environment, there is no requirement for that action to be canceled, or even changed. The EIS merely mandates that federal agencies think about the consequences of their actions and possible alternatives.

Endangered Species Act of 1973; Title 16 U.S.C. § 1531 et seq.

The Endangered Species Act (ESA) of 1973, as amended, provides a means for the protection of all endangered and threatened plant and animal species. It is comprehensive in that it also provides for the protection of the critical habitats on which these species depend for survival. Federal agencies, in consultation with the U.S. Fish and Wildlife Service and/or National Oceanic and Atmospheric Administration Fisheries Service, must insure that actions they authorize, fund, or carry out are not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of designated critical habitat of such species.

Clean Air Act of 1970; Title 42 U.S.C. § 7401 et seq.

The Clean Air Act (CAA) of 1970, as amended, was originally enacted to protect the quality of the nation's air resources and the public health and welfare. The second purpose of the CAA is to initiate a research and development program to achieve the prevention and control of air pollution. Third, the act provides means for technical and financial assistance for state and local governments so that they may carry out air pollution prevention and control programs. The final goal of the CAA is to encourage the development of regional air pollution prevention and control programs.

The law authorizes the Environmental Protection Agency to establish National Ambient Air Quality Standards (NAAQS) to protect health and public welfare and to regulate emissions of hazardous air pollutants. Federal agencies must comply with all federal, state and tribal air quality standards and requirements for smoke management when conducting prescribed fires.

Clean Water Act of 1972; Title 33 U.S.C. § 1251 et seq.

The Clean Water Act (CWA) of 1972, as amended, established the basic structure for regulating dischargers of pollutants into the waters of the United States and establishing quality standards for surface waters. In accordance with provisions of this statute, the CTUIR and the

Environmental Protection Agency have developed Total Maximum Daily Loads and a Water Quality Management Plan for the UIR.

Relationship to CTUIR Missions

The mission and functions of the Department of Natural Resources (DNR) are guided by the *First Foods Paradigm*. From the CTUIR point of view, natural resources upon which Tribal members depend are cultural resources, whether they are within the reservation, in the ceded lands, or at usual and accustomed fishing/hunting/gathering areas. In this respect, traditional archaeological practice differs from the Tribal perspective.

Incorporating this point of view, the CTUIR DNR has adopted a mission based on indigenous foods served at Tribal meals. These foods are served at ritual meals and are known to the CTUIR as *First Foods*. Listed in the order in which they are served, they are: water, salmon, deer, cous, and huckleberry.

The *First Foods* are central to the CTUIR DNR mission statement:

> *"To protect, restore, and enhance the First Foods - water, salmon, deer, cous, and huckleberry - for the perpetual cultural, economic, and sovereign benefit of the CTUIR. We will accomplish this utilizing traditional ecological and cultural knowledge and science to inform: 1) population and habitat management goals and actions; and 2) natural resource policies and regulatory mechanisms."*

The *First Foods* serving order includes "men's foods"--water, salmon, deer; and "women's foods"--cous and huckleberry. These gender categories reflect the harvest, preparation, and serving roles associated with *First Foods*. Much emphasis has deservedly been placed on water and salmon in response to water quality impacts and aquatic Endangered Species Act listings. The CTUIR has identified the need to call attention to ecological processes that sustain and produce *First Foods* in order to be responsible and responsive to the CTUIR community.

The *First Foods* are considered by the CTUIR DNR to constitute the *minimum* ecological products necessary to sustain CTUIR culture. Management efforts need to incorporate ecological processes (for example fire regimes in upland range and forest lands and high flows in floodplains) that relate to the sustained production of *First Foods*.

The *First Foods Paradigm* has been incorporated in, and will be implemented through, the Forest Management Plan.

The mission of the Department of Economic and Community Development is:

> *Improve and diversify the overall economy of the Umatilla Tribes while respecting the traditional cultural values.*

The Department of Economic and Community Development (DECD) has, and will continue to have, a role in forest management. As the arm of the Tribe pursuing economic development opportunities, DECD has sought to utilize and make economically viable forestry operations. One intention of purchasing land on the reservation is to self-fund those purchases by economic activities such as grazing, logging, farming or other management activities.

Relationship to Other Plans

Comprehensive Plan of the Confederated Tribes of the Umatilla Indian Reservation

In 1996, the CTUIR, through Board of Trustees Resolution Number 96-38, adopted a Comprehensive Plan that set forth the long range goals of its members as they relate to treaty reserved rights, both on and off the Umatilla Indian Reservation, and the current and future needs of the people. The Comprehensive Plan established the goal of promoting integrated natural resource management to ensure the long-term health, availability, wise use, and production of natural resources consistent with Tribal cultural values and sound management principles.

Two pertinent objectives of the Comprehensive Plan for management of natural resources include: (1) "Encourage, develop and implement watershed management plans to improve the quantity and quality of water in streams, aquifers, groundwater, and wetlands as well as to enhance and preserve fish and wildlife habitat and native plant communities" and (2) "Protect and maintain the forest lands of the Reservation and utilize forest management practices and timber harvesting where appropriate as a tool to restore and maintain the health of forest ecosystems on the Reservation." It appears the latter objective limits silvicultural practices to those appropriate to restore and/or maintain forest health. Thus, economic return to landowners was not to be the major consideration in management of Indian forests.

Columbia Basin Salmon Policy

In 1995, the CTUIR, through Board of Trustees Resolution Number 95-26, adopted a Columbia Basin Salmon Policy which stated that all watersheds in the Columbia Basin must be managed with standards comparable to those in the Upper Grande Ronde Anadromous Fish Habitat Protection, Restoration and Monitoring Plan. Therefore, this policy mandates the establishment of riparian management zones with the width of such zones based on the stream order.

Water Code and Total Maximum Daily Load

In 2003, the CTUIR Board of Trustees adopted Resolution Number 03-100, enacting a new comprehensive Water Code integrating Water Quality Implementing Provisions and Stream Zone Alteration Regulations into its text. The new Water Code established an anti-degradation policy to provide for the maintenance and protection of waters of the Umatilla Indian

Reservation. The Water Code further provided that any person who performs any activity that alters stream flow, water quality, ground contours, or perennial vegetation in several named stream zones on the Umatilla Indian Reservation first had to obtain a valid Stream Zone Alteration Permit.

In 2004, the CTUIR Board of Trustees adopted Resolution Number 04-73, enacting a Total Maximum Daily Load (TMDL) "to restore water quality and cultural integrity" of the waters of the reservation. The TMDL set water quality restoration targets for two pollutants, temperature and turbidity. The TMDL seeks to reduce late summer stream temperatures and the amount of in-stream fine sediments as much as possible.

Other Natural Resource Management Plans

The Forest Management Plan forms one leg of a comprehensive Integrated Natural Resource Management Plan for the Umatilla Indian Reservation (Figure 1-1). Although the Forest Management Plan includes a comprehensive assessment, prioritization, and optimization of all natural resource management concerns, it only provides management guidance on forest lands. The BIA and CTUIR adopted a Wildland Fire Management Plan in 2000. The Water Commission of the CTUIR adopted a Water Quality Management Plan in 2008 that identifies best management practices necessary to achieve the water quality objectives. These best management practices include, but are not limited to, establishment of streamside (riparian) management zones, ground cover maintenance, log removal techniques, and road/skid trail management.

Other natural resource management planning efforts currently underway include: (1) an Agricultural Management Plan, (2) a Range Management Plan, and (3) a Noxious Weed Management Plan. The CTUIR plans to initiate efforts to develop a Travel and Access Management Plan late in 2009 or early in 2010 to address important cultural and natural resource values.

Transportation System Plan and Right-of-Way Issues

The CTUIR is currently in the process of revising the 2001 Transportation System Plan. Because the revision to the Transportation System Plan was not initiated until early 2009, there was limited opportunity for coordination between the Transportation System Plan and the Forest Management Plan. Implementation of the Forest Management Plan will require close consultation with the Transportation Program within the Department of Public Works.

In 2009, the CTUIR, through Board of Trustees Resolution Number 09-022, formally established the Right-of-Way (ROW) Working Group. The CTUIR established the Right-of-Way Working Group to address issues associated with the lack of recorded easements for many of the roads on the UIR. The IDT for the Forest Management Plan and the Right-Of-Way Working Group have not met to discuss issues of mutual concern; however, it is likely right-of-way issues will be encountered in implementation of the Forest Management Plan.

Terminology in the Forest Management Plan

The Forest Management Plan describes the management direction for the BIA and CTUIR to achieve desired outcomes for forest management. There are basically four types of direction given by the Forest Management Plan in the pages that follow: desired conditions, goals, objectives, and standards. Each of these types is defined in detail below.

Desired conditions are descriptions of how forest resources should look and function to provide diverse and sustainable forest stands to sustain Tribal cultural values and to provide goods and services. The desired conditions present an integrated vision of a properly functioning forest that supports a broad range of biodiversity and cultural, social, and economic opportunities.

Goals are concise statements that help described desired conditions or how to achieve conditions. Goals are typically designed to maintain conditions, if they are currently within their desired range, or restore conditions to their desired range if they are currently outside that range. Goals are normally expressed in broad general terms.

Objectives are concise statements of actions or results designed to help achieve goals. Objectives form the basis for project level actions or proposals to help achieve goals. The timeframe for accomplishing objectives is considered to be the next 60 years. Accomplishment of all objectives will not be possible in the next 20 years due to the conservative approach taken in implementing vegetation treatments. The monitoring and evaluation program will insure vegetation treatments are in fact achieving desired outcomes.

Standards are limitations placed on management actions. Standards are typically action restrictions designed to prevent degradation of resource conditions so that conditions can be maintained or restored over time. They represent a preferred or advisable course of action generally expected to be carried out.

Adaptive Management

An adaptive management strategy, which is an ongoing process, is needed in order to effectively move toward and maintain ecological integrity, as well as cultural and economic resiliency. The intent of adaptive management is to use a continuous process of planning, implementing, monitoring, and evaluating management strategies (Figure 1-2). Management strategies may need to be adjusted when:

- An event changes the characteristics of the environment.
- New information accumulates over time, through monitoring, that indicates objectives are not being met.
- Research indicates a need for change.

Revision Timeframe

The Forest Management Plan may remain in effect until found to be inconsistent with Tribal goals, forest management policy, or the condition of the forest. Such a finding may be made in a formal review of the Forest Management Plan which shall occur no less than once every 15 years. More frequent reviews may occur as necessary. These reviews may accompany data gathering/analysis, such as re-measurement of the CFI plots, or development of a stand based inventory.

Future modeling of the anticipated effects of management strategies may become necessary as natural resource conditions change. Changes in the conditions of natural resources, in relation to desired future conditions, provide the essential information for effective adaptive management. As additional information becomes available, an amendment to the Forest Management Plan may become necessary.

The Forest Management Plan may be amended at any time by resolution of the Board of Trustees of the CTUIR and approval by the BIA. Revisions to the Forest Management Plan may take the following forms:

- Technical clarifications to fix or edit wording in order to clarify concepts. Such clarifications will be documented in a memo on file with the Forest Program Manager and the BIA.

- Revisions to modify and/or add issues to be addressed or modify/add goals and objectives to be achieved. Revisions would not normally involve changes in management strategies. Either the Board of Trustees of the CTUIR or the BIA may request revisions to the Forest Management Plan. The Interdisciplinary Team for the Forest Management Plan should evaluate the effectiveness of the Forest Management Plan at least once every 15 years.

- Amendments to recognize new information, or changes in resource conditions, that will necessitate changing management strategies. These amendments will be adopted by resolution of the Board of Trustees of the CTUIR and approval of the BIA.

Figure 1-1. Concept For An Integrated Natural Resource Management Plan

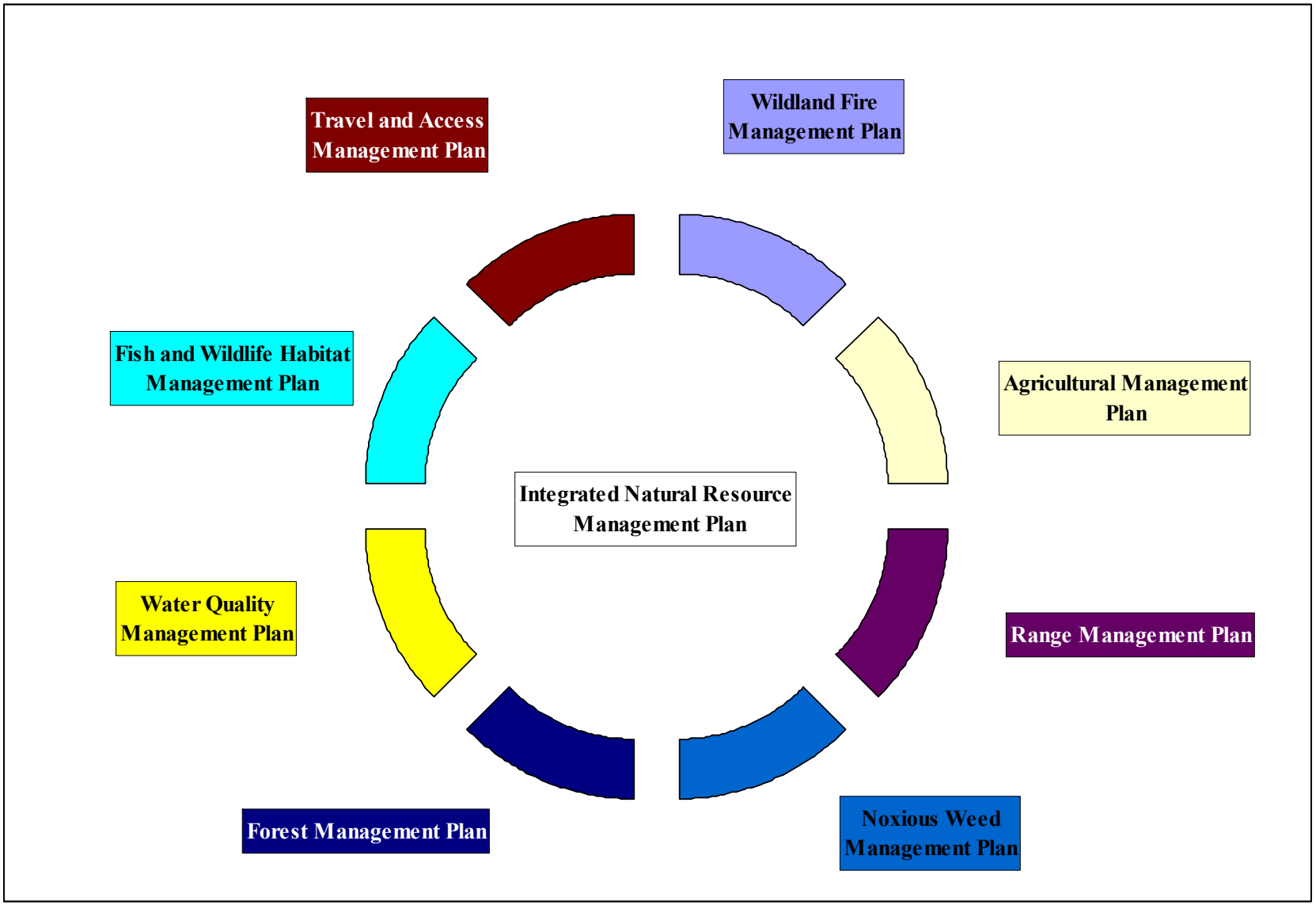
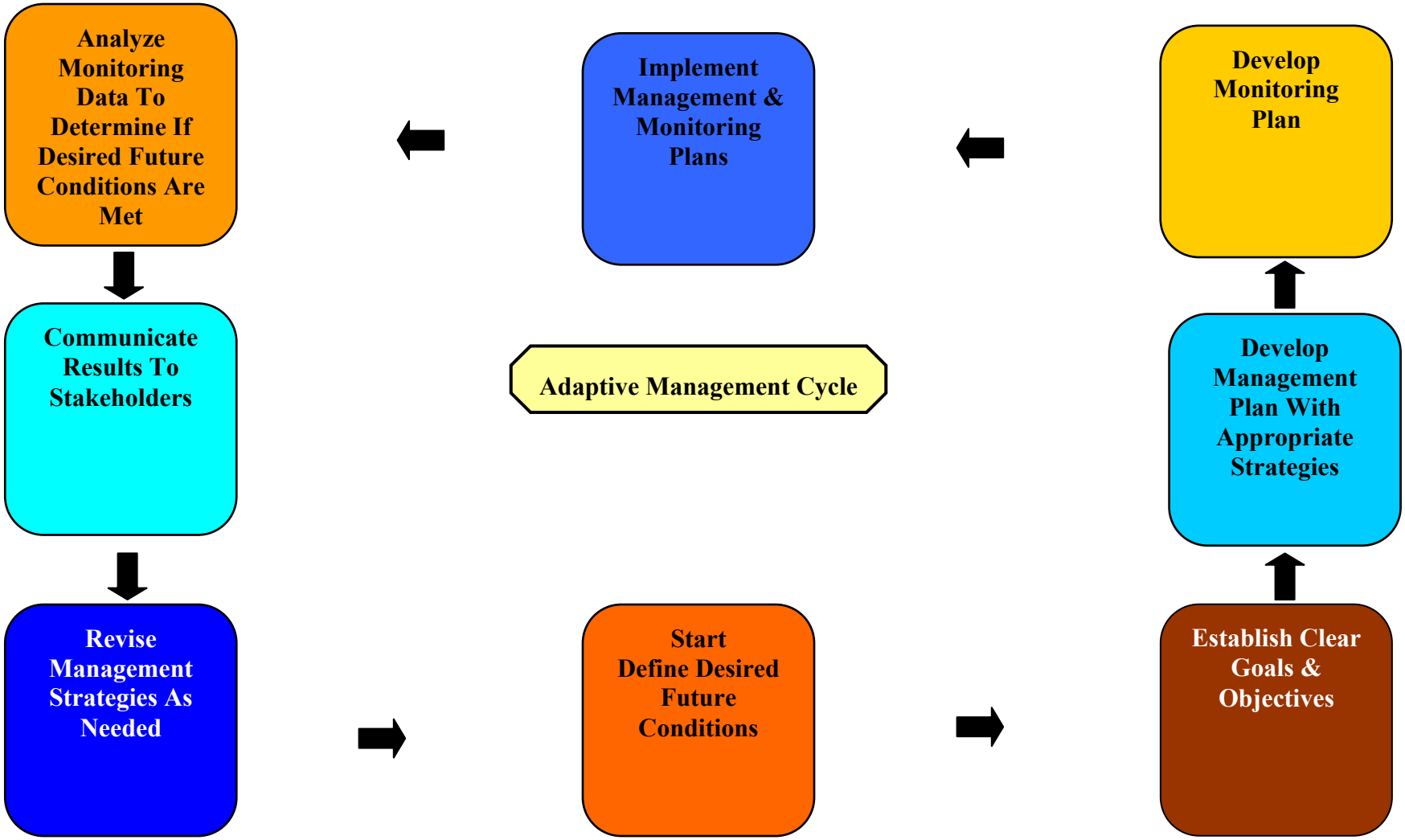


Figure 1-2. Forest Management Plan Adaptive Management Cycle



Chapter II - The Management Situation

Background Information

The UIR, established by the Treaty of June 9, 1855, 12 Statue 945, between the United States and the Cayuse, Umatilla and Walla Walla Tribes lies along the foothills of the Blue Mountains in northeastern Oregon immediately east of Pendleton (Figure 2-1). The UIR covers a variety of terrain and land uses including rough uneven forests and rangelands, gently sloping agricultural fields, and long narrow floodplains supporting dense riparian vegetation.

The CTUIR continue to depend on natural resources for development of a strong diversified economy while preserving cultural, subsistence and aesthetic values. Fishing and hunting, as well as the gathering of roots and berries, are deeply rooted within the Tribal social structure. The harvesting, processing, manufacturing and marketing of farm, forest, livestock, and mineral products provide income to landowners and the Tribes. Together with the Wildhorse Casino and Resort, use of natural resources form the foundation of the economy of the UIR at the present time. The CTUIR anticipate the development of the Coyote Business Park will further diversify the economy of the UIR in the future.

Description of the Umatilla Indian Reservation

Land Ownership Patterns

Today, the UIR consists of about 172,000 acres of land. Allotted trust, Tribal trust, and Tribal fee forest lands on the UIR represent approximately 20,000 acres (Figure 2-2). This forest land figure includes lands from the Johnson Creek Restoration Area but excludes all non-Indian owned lands. The Blue Mountains border the reservation to the east and the City of Pendleton lies to the west.

Today, the land ownership pattern on the UIR is a checkerboard of parcels falling into three main classes: (1) deeded land held in fee simple estate by non-Indians, Indians, and the CTUIR; (2) Tribal trust land with legal title held by the United States and the beneficial or equitable title held by the CTUIR; and (3) allotted trust land with legal title held by the United States and the beneficial or equitable title held by an individual Indian allottee or his or her heirs.

The combination of deeded land interspersed with trust land has produced a checkerboard pattern of land ownership on the UIR. The CTUIR has adopted a policy of purchasing non-Indian lands to restore Indian ownership as property becomes available and funds permit. Management of these lands poses unique challenges with jurisdictional problems.

Figure 2-1. Umatilla Indian Reservation, Umatilla County, Oregon.

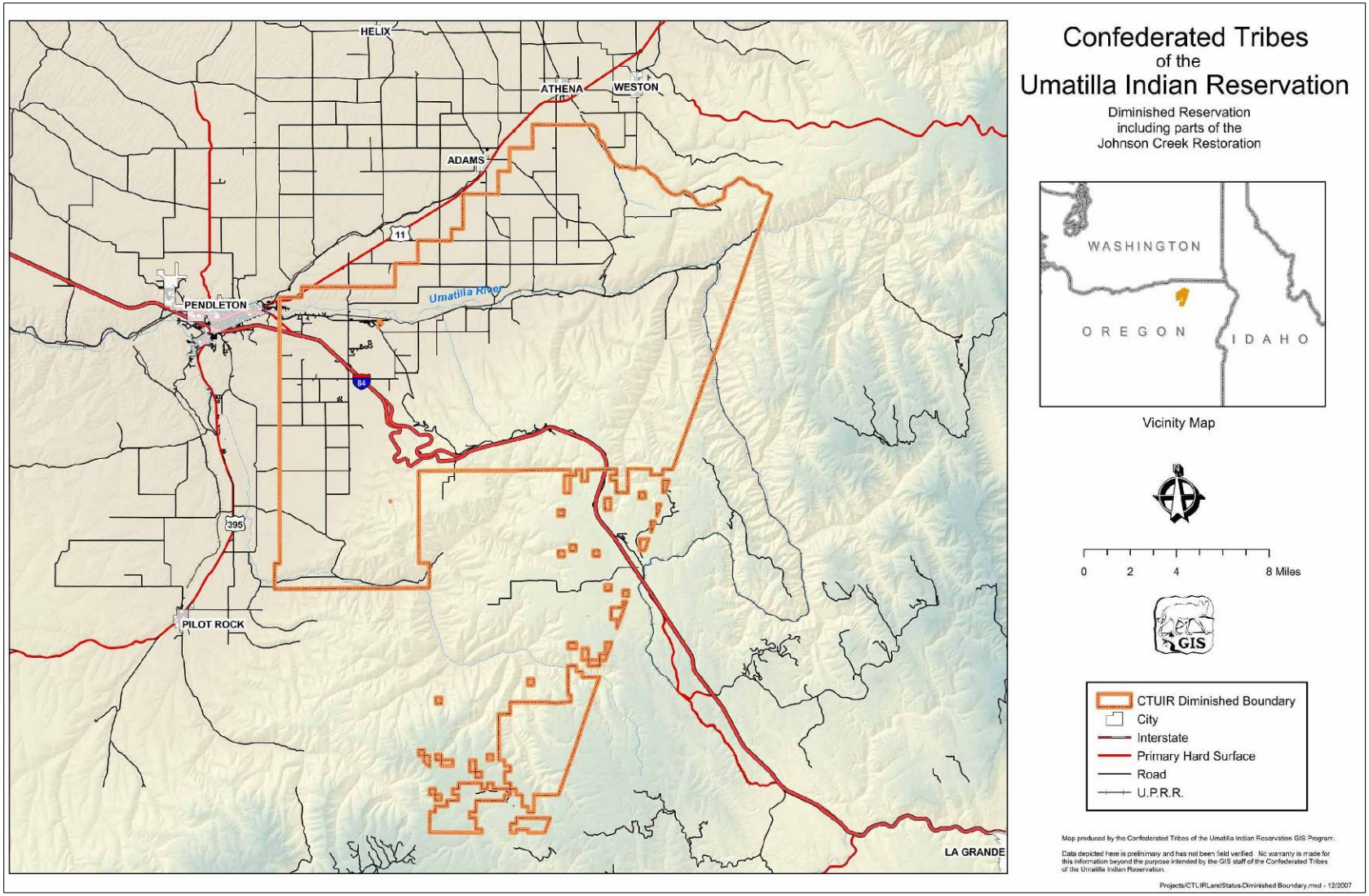
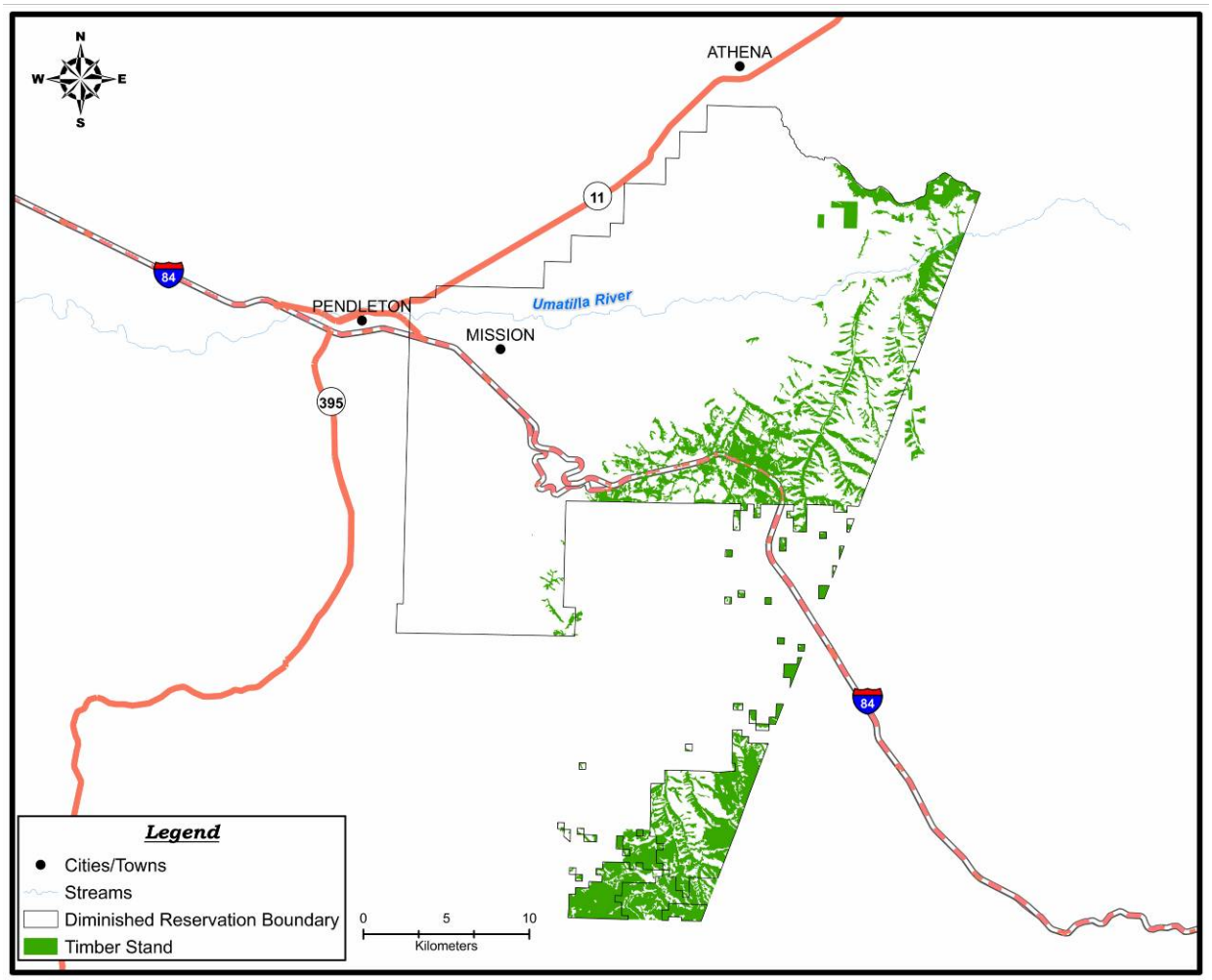


Figure 2-2. Forests Of The Umatilla Indian Reservation.



Topography

The landforms of the UIR can be divided into four groups: the *Pendleton Plains*, the *Blue Mountain Slope*, the *Blue Mountain Uplands*, and the *Stream Bottomlands* (Figure 2-3). The Pendleton Plains are a slightly dissected plateau characterized by gently rolling slopes favorable to crop production and are found between 1,200 to 2,000 feet above mean sea level (msl). The Blue Mountain Slope, located between 2,000-3,000 feet above msl, is a series of steep walled canyons ascending to the more plateau-like Blue Mountain Uplands. The Blue Mountain Uplands are a region of meadows and forested land. Approximately one-third of the UIR is within this subdivision with elevations ranging from 3,000 feet above msl to approximately 4,100 feet above msl. The Stream Bottomlands are found along the Umatilla River, McKay Creek, and Patawa Creek which dissect other landforms, and are characterized by moderately flat floodplains edged by moderate to steep slopes (Gonthier and Harris 1977).

Figure 2-3. Landforms Of The Umatilla Indian Reservation.

Pendleton Plains

Blue Mountain Slope

Blue Mountain Uplands

Stream Bottomlands

Climate

The entire UIR falls within Oregon's North Central Climatic Zone (Zone 6) (Johnson and Clausnitzer 1992). Weather is predominately influenced by Pacific Ocean air masses. The major influence to the regional climate is the Cascade Mountains which form a barrier against warm moist fronts from the Pacific Ocean (Johnson and Clausnitzer 1992). The Columbia Gorge provides a break in the curtain of the Cascade Mountains and occasionally allows moisture laden marine air to penetrate into the northern Blue Mountains. This climate is called temperate oceanic and differs significantly from temperate continental. During the winter, the temperate oceanic climate has greater cloudiness, increased precipitation, and higher relative humidity, with less fluctuation in temperatures.

The UIR experiences strong seasonal fluctuations in both temperature and precipitation. During summer, the UIR experiences a continental climate with warm days, cool nights and little precipitation. Winters exhibit short periods of extreme cold intermixed with milder temperatures. Heavy fog with visibility less than 1,200 feet is very common during the winter months along the valley bottoms when high pressure conditions are present. Precipitation also changes dramatically with the seasons, with most precipitation occurring during the fall, winter, and spring. The climate of the UIR is also strongly influenced by elevation. Precipitation falls mainly as rain at lower elevations. Average annual precipitation is markedly higher at higher elevations in the Blue Mountains with much of this occurring as snowfall (Johnson and Clausnitzer 1992).

Weather records obtained from the National Oceanic and Atmospheric Administration (NOAA) stations at Pendleton and Meacham reflect the elevation change between the western and eastern portions of the UIR. The Pendleton station is located at 1,482 feet and the Meacham station is located at 4,050 feet. Mean annual temperatures for Pendleton and Meacham are 52.3º Fahrenheit (F) and 43.7º F, respectively (30-year period of record). Mean precipitation levels are 12.2 inches and 32.7 inches at the Pendleton and Meacham stations, respectively.

Soils

The structural deformation of thousands of feet of Miocene basalt and its subsequent erosion created the varied topography of the Blue Mountains. Soils are a product of basalt weathering, silt size particles deposited by wind, and volcanic ash. The soils of south-facing uplands typically consist of loamy skeletal mixed mesic Lithic Argixerolls that are shallow and well drained. Volcanic ash originally deposited on steep north-facing (leeward) slopes has since been eroded. The soils formed in colluvium, residuum, and loess consist of Pachic Ultic Haploxerolls that are moderately deep and well drained. Soils on plateaus that may be moderately deep, or deep and well drained, consist of Typic Vitrandepts formed in volcanic ash, loess, and residuum. Other soils that are moderately deep or deep consist of Ultic Argixerolls that have not been greatly influenced by windblown ash or loess. These soils formed mainly in material weathered from basalt and colluvium (Johnson and Makinson 1988).

Water Quality/Instream Fisheries Habitat

Hydrology

Originating at nearly 6,000 feet in elevation, the Umatilla River headwaters flow out of the Blue Mountains through narrow, well-defined canyons. After leaving the mountains, the North and South Fork join to form the mainstem, a 90 mile reach of river which flows through a series of broad valleys that drain low rolling lands (ACOE 1999; ODEQ 2001). The mainstem Umatilla River has eight main tributaries: the North and South Forks of the Umatilla River and Meacham Creek in the upper basin; Wildhorse, Tutuilla, McKay and Birch Creeks in the mid basin; and Butter Creek in the lower basin (Table 2-1).

Most primary tributaries of the Umatilla River enter from the south. Wildhorse Creek drains the divide between the Umatilla River and the Walla Walla River to the north. The North and South Forks of the Umatilla River and Meacham Creek account for approximately 14% of the Umatilla River subbasin drainage area yet supply 40-50% of the average flow to the Umatilla River (U.S. Forest Service 2001). Average annual discharges are 223 cubic feet per second (cfs) for the Umatilla and 193 cfs for Meacham Creek. Water runoff peaks in April, while the lowest flows generally occur in September (U.S. Forest Service 2001). The average monthly discharge of the Umatilla River (measured at river mile (RM) 2.1) varies from 23 cfs in July to 1,095 cfs in April (low flow at the mouth occurs in July rather than September due to upstream withdrawals for irrigation, a difference that reflects seasonal variation in precipitation).

There are numerous smaller streams that flow into the Umatilla River. These streams include Isqúulktpe, Buckaroo, Coonskin, Moonshine, Cottonwood, and Mission Creeks. Big and Little Johnson Creeks drain Tribal lands in a portion of the Johnson Creek Restoration Area. Most of these creeks only carry water for their entire length during periods of snowmelt or sustained rainfall.

McCoy Creek, a tributary of the Grande Ronde River, drains the extreme southern portion of the Johnson Creek Restoration Area. Jennings Creek flows into Indian Lake, a reservoir constructed in 1969. Ensign Creek is the outlet to Indian Lake and flows into McCoy Creek. This area is located in an average elevation of 4,100 feet and the precipitation is dominated by snow.

Table 2-1. Mainstem Length And Drainage Areas Of Major Tributaries Of The Umatilla River.

Drainage	Length (miles)	Area (sq. miles)	Distance from the mouth of the Umatilla River (miles)
North Fork Umatilla	9	34	86
South Fork Umatilla	10	57	86
Meacham Creek	31	165	79
Wildhorse Creek	34	190	55
Tutuilla	10	61	52
McKay Creek	32	191	51
Birch Creek	31	291	47
Butter Creek	57	465	14

Most flooding events in the Umatilla basin result from rain-on-snow events. This usually occurs when snow accumulates between 1,500-3,500 feet elevation in the Blue Mountains and then is rapidly melted by rain and warm winds and usually occurs from December through February (Northwest Power and Conservation Council 2005).

Water Quality

The upper Umatilla subbasin has historically been valued as a source of cool, clean, abundant water and habitat for resident and migratory fish. For the last 150 years however, increased demands on the watershed have degraded water quality conditions. The CTUIR developed water quality standards in conjunction with the Environmental Protection Agency (EPA) in 1999 in order to regulate water quality conditions. A Total Maximum Daily Load (TMDL) that addresses stream temperature and turbidity, for which there is ample data to indicate water quality standards are not being met, was completed by the CTUIR in 2005 (CTUIR 2005). The TMDL establishes reduction goals for stream temperature and sediment and led to the completion of a Water Quality Management Plan (WQMP) in 2008 (CTUIR 2008). The CTUIR and other upstream users or management agencies will need to meet CTUIR water quality standards and established TMDL goals. The WQMP and associated monitoring plan will be implemented by the responsible entities to address these impairments.

Stream Temperature

Water temperature is a concern throughout most of the Umatilla River drainage from May until early November (periods of low flow). ODEQ (2001) listed 287 miles of the Umatilla subbasin as impaired for elevated water temperatures including the entire mainstem Umatilla River. The CTUIR (2005) listed seven streams or segments of streams within the UIR as water quality limited for temperature (CTUIR 2005). The highest water temperatures have been recorded in late July and early August when ambient air temperatures are high. During this period, the Umatilla River warms rapidly from the headwaters to the mouth, reaching sub-lethal (64°F to 74°F) and incipient lethal temperatures (74°F to 80°F) for salmonids its entire length. Most of the tributaries where temperature data were collected also reached sub-lethal and incipient lethal ranges for salmonids (ODEQ 2001).

Sediment and Turbidity

The Umatilla River produces large amounts of sediment, much of which originates from the weathered basalt and unconsolidated loess deposits--the dominant geology in the basin. The primary sources include both bank and upland erosion of tributaries and tributary watersheds (respectively), both of which may be accelerated by land uses (ODEQ 2001). The dominant erosion processes in the subbasin are surface erosion by sheetwash, rills and gullies, and bank erosion (ODEQ, 2001). Peak sedimentation usually occurs during rainstorms or snowmelts associated with freeze and thaw periods (Northwest Power and Conservation Council 2005).

Both the CTUIR and the State of Oregon have established numeric water quality standards for suspended solids or streambed fines (CTUIR 2005; ODEQ 2001). Umatilla Basin fisheries managers determined through basin-specific knowledge and literature review that a turbidity of

30 nephelometric turbidity units (NTU's) (not to exceed a 48-hour duration) standard will protect aquatic species (ODEQ 2001). The 30 NTU maximum was correlated to a level of total suspended solids (TSS) to derive watershed target concentrations/loading capacities. This threshold was then used in the TMDL to determine a reduction target for each subwatershed. One of the sediment-impaired stream segments that significantly deviated from the target standard was Wildhorse Creek (at its confluence with the Umatilla River), which had a peak turbidity value of over 5,000 NTU measured on April 23, 1997 (ODEQ 2001). The CTUIR identified segments of two streams, Umatilla River and Mission Creek on the UIR, that do not meet water quality standards for turbidity.

pH

Elevated summer temperatures, excessive algal (periphyton) growth, and attendant increases in pH are common during summer months in the upper Umatilla River as it flows from the North and South Forks of the Umatilla to the Highway 11 Bridge at RM 57.1 (ODEQ 2001).

Nitrate

Two stations (Spring Hollow Creek, a tributary to Wildhorse Creek, and Wildhorse Creek) have concentrations of nitrates >10 mg/L which violate general criteria set for public water supplies. Nitrates show up in very low concentrations (<0.10 mg/L total nitrate) in the upper subwatersheds, slightly elevated levels (<0.40 mg/L) in the middle Umatilla subwatershed, and 0.20 – 1.50 mg/L in McKay Creek (downstream of dam) (ODEQ 2001).

Bacteria

Most reaches and tributaries of the Umatilla River upstream of Pendleton have low levels of E. coli bacteria (less than 150 per 100 ml). Areas in the Umatilla subbasin with high E. coli counts include the middle reaches of Wildhorse Creek (450 to 600 per 100 ml) and the Umatilla River near and downstream of the city of Pendleton (greater than 600 per 100ml) (ODEQ, 2001).

Forest Composition/Timber Production

Background

Vegetation within the UIR is typical of ecosystems found throughout the Blue Mountain Region of Northeast Oregon (Johnson and Clausnitzer 1992). Vegetation composition varies and is dependent on elevation differences (ranging from 1,100 to 4,600 feet), aspect, moisture, and soil conditions. The vegetation can be generally characterized as forest (dry and moist forest), non-forest (grasslands and shrublands), and riparian areas and/or wetlands. Non-native plant species occur within these communities.

The principal forest tree species are ponderosa pine (*Pinus ponderosa)*, Douglas-fir (*Pseudotsuga menziesii*), lodgepole pine (*Pinus contorta*), grand fir (*Abies grandis*) and western

larch (*Larix occidentalis*). There are also smaller amounts of Engelmann spruce (*Picea engelmannii*) and quaking aspen (*Populus tremuloides*). The Interior Douglas-fir series is the principal forest plant community type found on the UIR. This series is typically dominated by Douglas-fir mixed with varying proportions of western larch, ponderosa pine, grand fir and lodgepole pine. The grand fir and lodgepole pine series are usually at the same intermediate elevations as the Douglas-fir series. The ponderosa pine series is usually at slightly lower elevations. Individual tree species occur in a predictable pattern based on a climatic gradient where temperature and moisture vary with change in aspect and elevation. The landscape has undergone and continues to undergo modifications due to both natural events (fire, windstorms) and human induced events (timber harvest, livestock grazing). These modifications determine in part the dominant tree species present on a specific site. Grand fir and Engelmann spruce generally are established under shade cover from Douglas-fir and/or ponderosa pine. Therefore, fire exclusion and the retention of closed canopies favors a greater proportion of the more shade tolerant species such as grand fir than historically.

The Douglas-fir/mallow ninebark (*Pseudotsuga menziesii/Physocarpus malvaceus*) and grand fir/northern twinflower (*Abies grandis/Linnaea borealis*) plant associations occupy approximately 50-55% of the forested area on the UIR. The Douglas-fir/pinegrass (*Pseudotsuga menziesii/Calamagrostis rubescens*) and Douglas-fir/creambush oceanspray (*Pseudotsuga menziesii/Holodiscus discolor*) plant associations occupy approximately 25-30% of the forested area. Other forested plant associations present on the UIR include ponderosa pine/common snowberry (*Pinus ponderosa/Symphoricarpos albus*), Douglas-fir/common snowberry (*Pseudotsuga menziesii/Symphoricarpos albus*), grand fir/big huckleberry (*Abies grandis/ Vaccinium membranaceum*), and grand fir/grouse whortleberry (*Abies grandis/Vaccinium scoparium*).

Much of the vegetative development on the reservation reflects the historic fire pattern. Weather systems coming up the Columbia Basin encounter the Blue Mountains. Thunderstorm activity is common and can be quite severe. In addition, Native Americans traditionally used fires for various reasons. These sources of fire ignition combined with the low rainfall patterns created a historic pattern of frequent fires. The fire return interval probably varied from about 6 to 8 years at the lower elevations to sixty or more years at the higher elevations. Where fires were frequent, fuels seldom accumulated to high levels and the fires were usually low severity (with only pockets of moderate to high severity) surface fires. Timber stands in these types of areas were early seral ponderosa pine in relatively open, even-aged stands. At the higher more moist elevations, the fire return frequency was much longer and fire events would develop into stand replacement fires. During the past approximately 75 years, land management entities have implemented aggressive fire suppression efforts. Fires were viewed as a destructive force endangering the natural resources of the UIR as well as human life.

The BIA and the CTUIR began harvesting timber on the UIR in the early 1950's. Most harvest was by selective cutting of the largest most valuable species including ponderosa pine and Douglas-fir leaving unmanaged stands of smaller trees. The combination of fire exclusion and selective cutting changed the structure, composition, and density of the forest. The suppression of fires removed the primary force historically thinning tree stands and selecting in favor of thick barked fire resistant trees or shade intolerant pioneer species. Selective logging sped up the

composition change by removing early seral species disproportionately while opening up the forest canopies only enough to favor the establishment of either shrubs or more shade tolerant climax species. Most forest stands now are multi-level stands where the upper canopy is often made up of the remnants of the pre-management forest (ponderosa pine and western larch) and the lower levels are frequently made up of over-dense stands of shade tolerant, climax species.

The suppression of frequently re-occurring fires has also allowed surface and ladder fuels to increase over historic levels. Trees dying from natural causes remain standing, or on the ground, for many years. With the drier conditions typically found on the UIR, dead woody material tends to decay much slower than in more moist areas. Prior to fire suppression, forest fuels were often quickly consumed and subsequently maintained at a much lower level than is currently present on the UIR.

In general, past management practices of selective harvesting and fire exclusion have encouraged many timber stands previously dominated by pine and larch to become stands dominated by shade-tolerant species (true firs and Douglas-fir). This altered successional pattern has resulted in an increase in incidence and severity of forest insect defoliators, bark beetles, and tree diseases. Insect and disease epidemics during the past 40 years have killed an un-naturally large number of trees decreasing overall forest health and adding to the fuel load. We have also seen an increase in bark beetle population in ponderosa pine stands due to unhealthy densities.

Next to catastrophic wildfires, forest insects cause the most visible and dramatic losses of conifers. Eight major insect pests have been identified including the western spruce budworm (*Choristoneura occidentalis*), Douglas-fir tussock moth (*Orgyia pseudotsugata*), mountain pine beetle (*Dendroctonus ponderosae*), Douglas-fir beetle (*Dendroctonus pseudotsugae*), spruce beetle (*Dendroctonus rufipennis*), fir engraver (*Scolytus ventralis*), western pine beetle (*Dendroctonus brevicomis*), and pine engraver (*Ips pini*). The most serious insect problem in these types is the western spruce budworm. This insect attacks Douglas-fir and the true firs. The mountain pine beetle periodically kills large numbers of ponderosa pine. The UIR has had a twenty-year history of repeated attacks by bark beetles and budworms. All of the forest types on the reservation have experienced significant mortality due to these insect epidemics.

Forest tree diseases also cause very serious losses that affect all resources. Forest diseases cause damage that is usually less visible or appears to be less dramatic than that caused by insect pests. Disease-caused losses occur over long periods of time, often over the entire life or rotation of a stand. Further, losses occur at relatively constant rates, although sometimes they increase during periods of environmental stress. Disease losses, while usually not as visible as defoliation or mortality that occurs during insect epidemics, over a rotation, may be comparable to or even exceed insect caused impacts. This is often the case with diseases such as stem decay. Trees may have indicators such as wounds or fungus fruiting bodies, but until trees break, are windthrown, or are cut, losses associated with cull and defect are not realized. Disease losses may be gradual such as with root diseases. As diseases progress, tree mortality occurs over a long period of time, and only a small proportion of trees die each year. Sites become understocked and therefore less productive. Diseases may also result in growth loss. Dwarf mistletoe may have this effect for many years before finally causing mortality.

Major forest diseases on the UIR include a variety of root diseases, stem decays, and dwarf mistletoes. The maintenance of continuous closed stands without wildfire has also led to a well established and geographically distributed dwarf mistletoe (*Arceuthobium spp.*) population. The parasite is most prevalent and destructive on Douglas-fir, western larch and ponderosa pine. These forest types are also characterized by many pockets of root rots which attack Douglas-fir, western larch, lodgepole pine and ponderosa pine. It is important to recognize that most pest caused damage and mortality are the result of pest complexes. Root diseases and bark beetles are closely associated. Root disease infected trees are weakened and frequently killed by beetles. Two or more different root diseases are often found together in centers of mortality.

Timber Inventory

The BIA and CTUIR stratified forest lands of the UIR into timber types in 2006 on the basis of the predominant tree species that provides the greatest canopy cover, tree size, and tree density. The BIA utilized 2004 aerial photography for this stratification. Each timber type is defined by species, size class, and density class as follows.

Species

- PP – (Ponderosa Pine) Ponderosa pine makes up at least 75 percent of the canopy cover.
- DF – (Douglas-fir) Douglas-fir makes up at least 75 percent of the canopy cover.
- LP – (Lodgepole Pine) Lodgepole pine makes up at least 75 percent of the canopy cover.
- PM – (Pine Mixed) Ponderosa pine makes up 40-75 percent of the canopy cover.
- MC – (Mixed Conifer) Douglas-fir, grand fir, and western larch make up 60 percent of the canopy cover.

Size Class

- Size Class 1 (Seedlings and Saplings) – These stands are comprised of at least 25 trees per acre with at least one-half less than 4.9 inches diameter at breast height (DBH). The stands have less than 1,500 board feet per acre and less than 10 square feet per acre in basal area.
- Size Class 2 (Pole) – These stands are comprised of trees of which at least one-half are between 5.0 and 8.9 inches DBH. The stands have less than 1,500 board feet per acre but more than 10 square feet per acre in basal area.
- Size Class 3 (Small Sawtimber) – These stands have at least 1,500 board feet per acre with over one-half the volume in trees between 9.0 and 20.9 inches DBH.
- Size Class 4 (Large Sawtimber) – These stands have at least 1,500 board feet per acre with over one-half the volume in trees over 21.0 inches DBH.

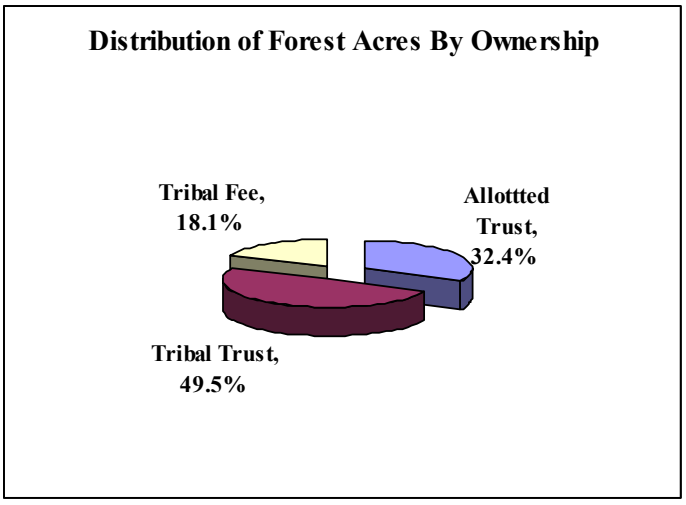
Density Class

- Density Class 1 – Poorly stocked areas with a crown closure of 10-39 percent.
- Density Class 2 – Medium stock areas with a crown closure of 40-69 percent.
- Density Class 3 – Well stocked areas with a crown closure of 70 percent or greater.

The BIA and CTUIR identified and mapped 48 timber types on approximately 25,153 acres of allotted trust, Tribal trust, Tribal fee, and private forest lands (Table 2-2). In order to be mapped, a forest stand had to be at least 10 acres in size.

The BIA and/or the CTUIR directly manage approximately 20,000 acres of allotted trust, Tribal trust, and Tribal fee forest acres out of the approximately 25,153 forest acres analyzed in this planning effort. Of the approximately 20,000 acres of allotted trust, Tribal trust, and Tribal fee forest acres, 49.5 percent is held in trust by the United States for the CTUIR, 32.4 percent is held in trust by the United States for individual Indian landowners, and 18.1 percent is owned by the CTUIR in fee status (Figure 2-4).

Figure 2-4. Distribution Of Approximately 20,000 Forest Acres By Ownership



The mixed conifer timber type is the most prevalent species group comprising 9,674 acres and 48.4 percent of the total forest acres for allotted trust, Tribal trust, and Tribal fee forested acreage (Table 2-3). The next most prevalent species group is ponderosa pine with approximately 4,734 acres or 23.7 percent of the forested acres. Table 2-4 presents a detailed summary of acres in each timber type by ownership.

Continuous Forest Inventory (CFI) plots are arranged on a regularly spaced grid at 0.275 mile intervals across Tribal and allotted trust lands on the UIR. Each plot is 1/5th acre. The initial installation of 306 CFI plots on the UIR occurred in 1990. These plots were re-measured in 2003. At the same time, an additional 10 plots were installed on trust forestlands that had previously been classified as non-forest. The data from these inventories was used to develop an Inventory Analysis Report. The BIA and CTUIR distributed the 316 CFI plots over the 16,375 acres of allotted and Tribal trust forest acres for an average sampling intensity of 1 plot in approximately 52 acres. The BIA and CTUIR did not install CFI plots on Tribal fee or private forest lands. The BIA and CTUIR recorded timber types for each of the 316 CFI plots. However, the CFI plots occurred in only 29 of the 48 timber types leaving 19 timber types not sampled.

Table 2-2. Forested Acres On The Umatilla Indian Reservation By Subwatershed, Ownership, Riparian Status, And Forest Type.

Subwatershed (HUC) Name	Forested Acres	Forested Acres by Ownership				Forested Riparian Acres	Forested Acres by Species				
		Allotted Trust	Tribal Trust	Tribal Fee	Private		Douglas-Fir	Lodgepole Pine	Mixed Conifer	Pine Mix	Ponderosa Pine
Eagle Creek	803.9	501.1		65.9	236.9	14.2				251.3	552.6
Upper Spring Hollow	136.5	136.3			0.2						136.5
North Umatilla River	528.4	129.8	10.7		387.9	71.1	54.7		161.2	130.9	181.6
Saddle Hollow	205.5	35.9	3.9		165.7	57.4				70.5	135
Upper Umatilla River	314	129.1			184.9	18.4	74.2		60.4	111.7	67.7
Thorn Hollow	6.4				6.4	0.2					6.4
Lower Meacham Creek	518.2	148.2		10.8	359.2	62.4	59.6		169.1	260.6	28.9
Gibbon Ridge	36.6				36.6	4				17.1	19.5
Red Elk Canyon	42.3	38			4.3	8			1.1		41.2
Buckaroo Creek	2100.6	893.5	154	622	431.1	235.1			945	455.1	700.5
Meacham Creek	1116.2	202.4	38.2	648.5	227.1	198.5	208.2		397.5	316.1	194.4
Boston Canyon	238.5	135.4		49	54.1	67	24		146.7	52.7	15.1
Coonskin Creek	197.2	123.5	25.3		48.4	4.4				74	123.2
Cottonwood Creek	266.3	191.3		35.2	39.8	16.5	1.3		0.8	110.4	153.8
Red Hawk Gulch	120.2	41.5			78.7	0.2	0.3				119.9
Upper North Coyote Creek	7.9	7.9									7.9
Isqúulktpe Creek	1882.8	477.6	457.6	495.9	451.7	328.6	12.5		1376.9	358.7	134.7
Little Isqúulktpe Creek	593.8	271.1	163.3	73.8	85.6	115			437.1	156.7	
Deadman Pass Canyon	1934.1	639.7	201.3	343.2	749.9	228.3	220.6		787.6	378.1	547.8
Lost Pin Creek	809.9	400.1	32.8	196.9	180.1	119.3	49.8		7.5	225	527.6
Darr Creek	39.8		39.8						1	38.8	
Upper Meacham Creek	145.6		145.6					16.7	84	13.5	31.4
Little McKay Creek	29.2	29.2				2.3					29.2

Table 2-2. Forested Acres On The Umatilla Indian Reservation By Subwatershed, Ownership, Riparian Status, And Forest Type.

Subwatershed (HUC) Name	Forested Acres	Forested Acres by Ownership				Forested Riparian Acres	Forested Acres by Species				
		Allotted Trust	Tribal Trust	Tribal Fee	Private		Douglas-Fir	Lodgepole Pine	Mixed Conifer	Pine Mix	Ponderosa Pine
Denson Canyon	12.6	9.8			2.8	4.6					12.6
Beaver Creek	392.6		392.6			16.1	3.4	27.9	99.4	239.4	22.5
McKay Creek	1557.4		1557.4			127.1	46.2		534.4	681.2	295.6
Wood Hollow	19.1		19.1			0.2			19.1		
Bassey Creek	150.9		150.9			4.1			147.7	3.2	
Snipe Creek	72		72			7.3			60.6	11.4	
Little Johnson Creek	1092.3		1092.3			157.8	22.2		582.9	433.4	53.8
Big Johnson Creek	2357.9		2357.9			353.3	28.7		1860.8	312.1	156.3
East Birch Creek	227		227			11.5	8.4		172		46.6
Jenning's Creek	2237.7		2237.7			137.3		171.2	1404.4	353.5	308.6
McCoy Creek	341.4		341.4			32.2			272	20.2	49.2
Upper Wild Horse	23.5				23.5	1.3			2.7	20.5	0.3
Wild Horse Mountain	939.8	189.8	18.2		731.8	9.3			512.4	282.4	145
Bachelor Canyon	2319.3	1044.3	37.6	961.3	276.1	393	49.1		1256.1	491.3	522.8
Moonshine Creek	475.6	412.6		35.7	27.3	30.4					475.6
Bell Cow Creek	78		78			4.4	3.1		21.8	53.1	
Table Rock	214.2	66.4	4.5	88	55.3	46.3					214.2
Red Spring	19.5		19.5			1.6				13	6.5
Mainstem Umatilla River	267.3	102.3			165	25.1	13		22.8	133.6	97.9
Mission Creek	280.8	127.8	14.8		138.2	17.7			52.8		228
Total	25152.8	6484.6	9893.4	3626.2	5148.6	2931.5	879.3	215.8	11597.8	6069.5	6390.4

Table 2-3. Forest Acres By Major Species Group By Ownership.

Species	Allotted Trust		Tribal Trust		Tribal Fee		All Ownerships	
	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent
Ponderosa Pine	2,721.6	41.9	1,113.5	11.3	899	24.8	4,734.1	23.7
Douglas-Fir	285.3	4.4	148.9	1.5	243.3	6.7	677.5	3.4
Lodgepole Pine			215.8	2.2			215.8	1.1
Pine Mixed	1,440.0	22.1	2,455.5	24.8	804	22.2	4,699.5	23.5
Mixed Conifer	2,055.9	31.6	5,958.5	60.2	1,679.3	46.3	9,673.7	48.4
Total	6,502.8	100.0	9,892.2	100.0	3,625.6	100.0	20,000.6	100.0

Table 2-4. Distribution Of Timber Types By Ownership.

Species	Size Class	Density Class	Stratum	Allotted Trust	Tribal Trust	Tribal Fee	Grand Total
PP	1	1	**PP11**	574.2	19.6	18.2	612.0
		2	**PP12**	37.1	6.7	45.1	88.9
		3	**PP13**	69.9	3.5	23.2	96.6
	Total			681.2	29.8	86.5	797.5
	2	1	**PP21**	102.2	72.1	62.3	236.6
		2	**PP22**	158.2		100.6	258.8
		3	**PP23**	408.1	13.2	49.3	470.6
	Total			668.5	85.3	212.2	966.0
	3	1	**PP31**	278.6	376.2	76.2	731.0
		2	**PP32**	677.9	265.9	334.5	1,278.3
		3	**PP33**	235.5	23.3	114.6	373.4
	Total			1,192.0	665.4	525.3	2,382.7
	4	1	**PP41**	135.3	237.3	33.8	406.4
		2	**PP42**	43.3	95.7	41.2	180.2
		3	**PP43**	1.3			1.3
	Total			179.9	333.0	75.0	587.9
PP Total				2,721.6	1,113.5	899.0	4,734.1
MC	1	1	**MC11**		19.2	44.5	63.7
		2	**MC12**	1.3	4.4	74.3	80.0
		3	**MC13**	49.0	0.2	70.1	119.3
	Total			50.3	23.8	188.9	263.0
	2	1	**MC21**		41.2		41.2
		2	**MC22**	3.5	35.0	7.5	46.0
		3	**MC23**	47.0	78.3	149.5	274.8

Table 2-4. Distribution Of Timber Types By Ownership.

Species	Size Class	Density Class	Stratum	Allotted Trust	Tribal Trust	Tribal Fee	Grand Total
	Total			50.5	154.5	157.0	362.0
	3	1	**MC31**	119.7	1,710.0	204.7	2,034.4
		2	**MC32**	313.9	1,934.9	412.1	2,660.9
		3	**MC33**	988.9	1,442.5	461.8	2,893.2
	Total			1,422.5	5,087.4	1,078.6	7,588.5
	4	1	**MC41**	86.3	101.0	65.2	252.5
		2	**MC42**	178.3	257.4	135.7	571.4
		3	**MC43**	248.0	334.4	53.9	636.3
	Total			512.6	692.8	254.8	1,460.2
MC Total				2,035.9	5,958.5	1,679.3	9,673.7
PM	1	1	**PM11**	13.2	1.8		15.0
		2	**PM12**				
		3	**PM13**				
	Total			13.2	1.8		15.0
	2	1	**PM21**	8.5	7.8	46.8	63.1
		2	**PM22**	7.0		5.4	12.4
		3	**PM23**	68.7		18.1	86.8
	Total			84.2	7.8	70.3	162.3
	3	1	**PM31**	47.7	590.1	121.0	758.8
		2	**PM32**	404.4	782.8	212.8	1,400.0
		3	**PM33**	416.8	351.9	213.2	981.9
	Total			868.9	1,724.8	547.0	3,140.7
	4	1	**PM41**	55.6	101.8	8.1	165.5
		2	**PM42**	364.2	415.0	133.2	912.4
		3	**PM43**	53.9	204.3	45.4	303.6
	Total			473.7	721.1	186.7	1,381.5
PM Total				1,440.0	2,455.5	804.0	4,699.5
DF	1		**DF13**				
	Total						0.0
	2	3	**DF23**	12.7		15.5	28.2
	Total			12.7		15.5	28.2
	3	1	**DF31**	12.9	22.2	8.1	43.2
		2	**DF32**	48.0	28.9	81.9	158.8
		3	**DF33**	192.3	97.8	137.8	427.9
	Total			253.2	148.9	227.8	629.9

Table 2-4. Distribution Of Timber Types By Ownership.

Species	Size Class	Density Class	Stratum	Allotted Trust	Tribal Trust	Tribal Fee	Grand Total
	4	2	**DF42**	4.2			4.2
		3	**DF43**	15.2			15.2
	Total			19.4			19.4
DF Total				285.3	148.9	243.3	677.5
LP	1	1	**LP11**		2.7		2.7
		2	**LP12**		57.7		57.7
		3	**LP13**		6.4		6.4
	Total				66.8		66.8
	2	2	**LP22**		91.1		91.1
		3	**LP23**		57.8		57.8
	Total				148.9		148.9
LP Total					215.8		215.8
Grand Total				6,482.8	9,892.2	3,625.6	20,000.6

There is a large variation in the sampling intensity between timber types ranging from one plot per 15 acres to one plot to 198 acres (Table 2-5). The distribution of plots across the landscape is not in proportion to the number of acres in each timber type. Given the unequal distribution of CFI plots by timber type, data from the CFI plots must be treated as a stratified sample. Analysis of the data required that results be determined by timber type. The relative contribution of each timber type to the results for the total land base is in proportion to the acres in the timber type in accordance to stratified sampling estimation methods.

The BIA and CTUIR contracted with Mason, Bruce & Girard, Inc. to analyze the 2003 CFI data based on the 2006 timber type stratification. In order to arrive at estimates for total timber volume and growth rates, 19 timber types were aggregated with a sampled type that is as similar as possible in terms of species, size class, and density class. Mason, Bruce & Girard, Inc. estimated the total sawtimber volume to be 244 million board feet on approximately 20,000 acres of Tribal trust, allotted trust, and Tribal fee timberland on the UIR (Fairweather 2009). In 2003, Douglas-fir, ponderosa pine, grand fir, and western larch comprised 47%, 34%, 14% and 5%, respectively, of the total volume. Tribal trust and allotted trust lands have an estimated 199 million board feet of sawtimber on 16,374 acres. Tribal fee lands have an estimated 45 million board feet on 3,626 acres (Table 2-6). In 2003, there was an average of 12,207 net board feet per acre across all ownerships (Table 2-7).

Table 2-5. Distribution Of Acres And CFI Plots By Timber Type.

Before Aggregating Types-				After Aggregating Types Into Reporting Types-			
Type	**Allotted And Tribal Trust Acres**	**No. CFI Plots**	**Acres/Plot**	**Report Type**	**Allotted And Tribal Trust Acres**	**No. CFI Plots**	**Unsampled Timber Types Included**
PP11	593.8	3	198	**PP11**	593.8	3	
PP12	43.8						
PP13	73.4	1	73	**PP13**	117.2	1	PP12
PP21	174.2	2	87	**PP21**	174.2	2	
PP22	158.2	5	32	**PP22**	158.2	5	
PP23	421.2	12	35	**PP23**	421.2	12	
PP31	654.8	11	60	**PP31**	654.8	11	
PP32	943.8	19	50	**PP32**	943.8	19	
PP33	258.8	6	43	**PP33**	258.8	6	
PP41	372.5	11	34	**PP41**	372.5	11	
PP42	139.0	1	139	**PP42**	140.3	1	PP43
PP43	1.3						
MC11	19.2						
MC12	5.7						
MC13	49.2						
MC21	41.2	1	41	**MC21**	115.3	1	MC11, MC12, MC13
MC22	38.5						
MC23	125.3	2	63	**MC23**	163.8	2	MC22
MC31	1829.7	35	52	**MC31**	1829.7	35	
MC32	2248.7	45	50	**MC32**	2248.7	45	
MC33	2431.5	45	54	**MC33**	2431.5	45	
MC41	187.3	4	47	**MC41**	187.3	4	
MC42	435.7	5	87	**MC42**	435.7	5	
MC43	582.3	10	58	**MC43**	582.3	10	
PM11	15.0						
PM21	16.3						
PM22	7.0						
PM23	68.7						
PM31	637.8	11	58	**PM31**	669.1	11	PM11, PM12, PM13,

Table 2-5. Distribution Of Acres And CFI Plots By Timber Type.

Before Aggregating Types-				After Aggregating Types Into Reporting Types-			
Type	**Allotted And Tribal Trust Acres**	**No. CFI Plots**	**Acres/Plot**	**Report Type**	**Allotted And Tribal Trust Acres**	**No. CFI Plots**	**Unsampled Timber Types Included**
							PM21
PM32	1187.2	29	41	**PM32**	1262.9	29	PM22, PM23
PM33	768.7	17	45	**PM33**	768.7	17	
PM41	157.4	3	52	**PM41**	157.4	3	
PM42	779.1	10	78	**PM42**	779.1	10	
PM43	258.2	7	37	**PM43**	258.2	7	
DF23	12.7						
DF31	35.1	1	35	**DF31**	47.7	1	DF13, DF23
DF32	76.8	1	77	**DF32**	76.8	1	
DF33	290.1	15	19	**DF33**	309.5	16	DF42, DF43
DF42	4.2						
DF43	15.2	1	15				
LP11	2.7						
LP12	57.7	1	58	**LP12**	66.8	1	LP11, LP13
LP13	6.4						
LP22	91.1	1	91	**LP22**	148.9	2	LP23
LP23	57.8	1	58				
	16,374.4	316			16,374.4	316	

Table 2-6. Total Sawtimber Volume (MBF) By Species And Owner for Trust and Tribal Fee Lands In 2003.

		Total Net MBF in 2003						
Type	Acres (All Owners)	Grand Fir	Western Larch	Engelmann Spruce	Lodgepole Pine	Ponderosa Pine	Douglas-fir	All Species
Allotted Trust	6,482.8	8,954.5	2,360.9	453.1	72.4	31,750.0	37,073.8	80,664.7
Tribal Trust	9,892.2	18,412.2	7,095.6	1,137.9	251.5	35,472.3	55,774.6	118,144.1
Tribal Fee	3,625.6	5,646.5	1,640.3	246.2	67.9	15,782.9	21,567.3	44,951.1
Total	20,000.6	33,013.2	11,096.8	1,837.2	391.8	83,005.2	114,415.7	243,959.9

Table 2-7. Average Board Foot Volume Per Acre By Species And Owner In 2003.

Owner	Acres	Net Board Feet per Acre in 2003						
		Grand Fir	Western Larch	Engelmann Spruce	Lodgepole Pine	Ponderosa Pine	Douglas-fir	All Species
Allotted Trust	6,482.8	1,381.4	364.2	69.9	11.2	4,897.9	5,719.2	12,443.8
Tribal Trust	9,892.2	1,861.3	717.3	115.0	25.4	3,585.9	5,638.3	11,943.3
Tribal Fee	3,625.6	1,557.4	452.4	67.9	18.7	4,353.3	5,948.7	12,398.5
Total	20,000.6	1,591.1	524.7	88.0	18.3	4,236.0	5,748.9	12,206.9

Growth

Total annual net growth on the area (in the period 1990 to 2003) is estimated to be 32,900 board feet, which is quite low due to heavy mortality in western larch, grand fir, and Douglas-fir. In these trees, the volume lost to mortality outpaced gains in volume (Table 2-8). Net growth is the gross growth less the volume lost to mortality. Gross growth is the sum of accretion and ingrowth. Accretion is the increase in board foot volume on trees that were already sawtimber size when they were first inventoried. Ingrowth is new sawtimber volume in the inventory from trees that were not sawtimber size when they were first inventoried.

Table 2-8. Total Annual Net Growth (MBF) For The Period 1990 To 2003, By Ownership And Species.

Owner	Acres	Total Net Annual Growth (MBF) 1990-2003						
		Grand Fir	Western Larch	Engelmann Spruce	Lodgepole Pine	Ponderosa Pine	Douglas-Fir	All Species
Allotted Trust	6,482.8	-119.9	-34.7	11.2	0.8	425.4	102.0	384.9
Tribal Trust	9,892.2	-602.2	2.7	33.0	4.5	350.1	-140.0	-352.0
Tribal Fee	3,625.6	-101.7	-7.4	6.2	1.6	167.2	49.4	115.4
Total	20,000.6	-823.8	-39.4	50.4	6.9	942.7	11.4	148.2
Allotted & Tribal Trust Total	16,375	-722.0	-32.0	44.2	5.3	775.4	-38.0	32.9

Annual net growth per acre is quite low averaging only two net board feet per acre over all species. Ponderosa pine is growing the fastest at 47 net board feet per acre per year but this growth is offset by negative net growth in grand fir of 44 net board feet per acre per year (Table 2-9). Much of the negative net growth is occurring in the mixed conifer timber types. The mixed conifer timber type occupies about 60 percent of the Tribal trust forest acres and only 30 percent of the allotted trust forest acres. Overall, negative net growth occurred from 1990 to

2003 on Tribal trust forests while positive net growth occurred on allotted trust and Tribal fee forest acres.

Table 2-9. Total Annual Net Growth (MBF) Per Acre For The Period 1990 To 2003, By Ownership And Species.

Owner	Acres	Annual Net Growth Per Acre 1990-2003						
		Grand Fir	Western Larch	Engelmann Spruce	Lodgepole Pine	Ponderosa Pine	Douglas-Fir	All Species
Allotted Trust	6,482.8	-18.5	-5.3	1.7	0.1	65.6	15.7	59.4
Tribal Trust	9,892.2	-60.9	0.3	3.3	0.5	35.4	-14.2	-35.6
Tribal Fee	3,625.6	-28.0	-2.0	1.7	0.4	46.1	13.6	31.8
Total	20,000.6	-41.2	-1.9	2.5	0.4	47.1	0.5	7.3
Allotted & Tribal Trust Total	16,375.0	-44.1	-2.0	2.7	0.3	47.4	-2.3	2.0

Forest Health

There were an average of 89 live trees greater than 6 inches DBH per acre on the 316 CFI plots in 2003 (Table 2-10). Overall, 59% of the trees appear to have no problems, with Engelmann spruce appearing to be the most problem-free species (Table 2-11). However, spruce is a minor species. Western larch appears to be the least problem-free species, with only 19% of those trees exhibiting no problem, and nearly half impacted by dwarf mistletoe. However, western larch is a relatively minor species in the population also. Lodgepole pine, another minor species, is being heavily impacted by dwarf mistletoe and physical defects.

Table 2-10. Average Number Of Live Trees Per Acre By Species And Tree Problem In 2003.

Tree Problem	Average Live Trees Per Acre ≥ 6 Inches DBH						
	Grand Fir	Western Larch	Engelmann Spruce	Lodgepole Pine	Ponderosa Pine	Douglas-Fir	All Species
None	9.99	0.72	0.53	1.80	18.54	21.32	52.90
Bark Beetles	0.10	0.02	0.00	0.00	0.20	0.21	0.52
W. Spruce Budworm	0.43	0.00	0.00	0.00	0.00	0.35	0.78
Dwarf Mistletoe	0.00	1.81	0.00	0.27	0.01	6.34	8.44
Stem Rusts	0.00	0.02	0.00	0.19	0.00	0.02	0.22
Stem Cankers	0.00	0.00	0.00	0.06	0.02	0.01	0.09
Stem Decays	1.19	0.25	0.00	0.02	0.34	0.91	2.70
Foliar Pathogens	0.03	0.00	0.00	0.04	0.15	0.00	0.21
Root Diseases	0.03	0.02	0.00	0.00	0.00	0.17	0.22
Animal Damage	0.00	0.00	0.00	0.00	1.01	0.00	1.01

Table 2-10. Average Number Of Live Trees Per Acre By Species And Tree Problem In 2003.

Tree Problem	Average Live Trees Per Acre ≥ 6 Inches DBH						
	Grand Fir	Western Larch	Engelmann Spruce	Lodgepole Pine	Ponderosa Pine	Douglas-Fir	All Species
Weather	0.00	0.06	0.00	0.13	0.32	0.34	0.85
Other Damage	0.03	0.00	0.00	0.00	0.11	0.02	0.16
Physical Defects	2.75	0.85	0.02	0.27	6.95	10.15	20.98
All Live Trees	14.55	3.74	0.55	2.77	27.65	39.84	89.09

Table 2-11. Distribution Of Insect, Disease, And Other Problems Within Species, 2003.

Tree Problem	Percentage of Live Trees Per Acre >= 6" DBH						
	Grand Fir	Western Larch	Engelmann Spruce	Lodgepole Pine	Ponderosa Pine	Douglas-fir	All Species
None	68.7%	19.2%	97.2%	65.1%	67.1%	53.5%	59.4%
Bark Beetles	0.7%	0.4%	0.0%	0.0%	0.7%	0.5%	0.6%
W. Spruce Budworm	3.0%	0.0%	0.0%	0.0%	0.0%	0.9%	0.9%
Dwarf Mistletoe	0.0%	48.5%	0.0%	9.9%	0.0%	15.9%	9.5%
Stem Rusts	0.0%	0.4%	0.0%	6.8%	0.0%	0.0%	0.2%
Stem Cankers	0.0%	0.0%	0.0%	2.0%	0.1%	0.0%	0.1%
Stem Decays	8.2%	6.7%	0.0%	0.5%	1.2%	2.3%	3.0%
Foliar Pathogens	0.2%	0.0%	0.0%	1.3%	0.5%	0.0%	0.2%
Root Diseases	0.2%	0.4%	0.0%	0.0%	0.0%	0.4%	0.3%
Animal Damage	0.0%	0.0%	0.0%	0.0%	3.7%	0.0%	1.1%
Weather	0.0%	1.7%	0.0%	4.6%	1.1%	0.9%	1.0%
Other Damage	0.2%	0.0%	0.0%	0.0%	0.4%	0.0%	0.2%
Physical Defects	18.9%	22.7%	2.8%	9.8%	25.1%	25.5%	23.6%
All Live Trees	100%	100%	100%	100%	100%	100%	100%

The most common problem over all species in trees 6 inches DBH and larger is physical defects, characterized by forks, crooks, and sweep, affecting nearly 24% of the trees. Other problems noted, in order of frequency, were dwarf mistletoe, stem decay, and defoliation due to the western spruce budworm. Dwarf mistletoe affects approximately 16 percent of Douglas-fir. However, while the parasite is relatively common, it does not appear to be a serious factor affecting growth or mortality. Stem decays affect 8.2 percent and 2.3 percent of the grand fir and Douglas-fir trees, respectively. Damage levels on infected trees ranged from light to moderate. The western spruce budworm affected 3 percent and 1 percent of the grand fir and Douglas-fir trees in 2003, respectively.

Non-Forest Vegetation

Much of the UIR was historically covered by grasslands and shrubland ecosystems. The major dominants of grassland communities included bluebunch wheatgrass (*Psuedoroegneria*

spicatum), Idaho fescue (*Festuca idahoensis*), Sandberg's bluegrass (*Poa secunda*), and giant wild rye (*Elymus cinereus*) (Shelford and Hanson, 1947). The native grasses offered high quality grazing for livestock. Remnant strips of grasslands still exist throughout farmed areas, but are generally confined to areas inappropriate for farming. The combined stress of grazing and fire has allowed gray rabbitbrush (*Chrysothamnus nauseosus*), medusahead (*Taeniatherum asperum*), and cheatgrass (*Bromus tectorum*) to invade and dominate these communities.

Shrub communities occur primarily on north and east facing slopes. Common snowberry (*Symphoricarpos albus*) associated with mesic grasslands occurs in small dense patches throughout the UIR. Nootka rose (*Rosa nutkana*) along with Idaho fescue comprises another low shrub community although of limited extent. The most abundant tall shrub community is dense black hawthorn (*Crataegus douglasii*) that forms stands with a closed canopy resulting in poorly represented understory. Mallow ninebark (*Physocarpus malvaceus*) dominated shrub fields are frequent in narrow side canyons where recent fires have occurred. Redstem ceanothus (*Ceanothus sanguineus*) is a common associate in forested, mountain brush or grassland type.

Riparian Areas and Wetlands

Riparian areas contain the most biologically diverse habitats and species assemblages because of their variety of structural features (including live and dead vegetation) and proximity to water bodies (Quigley and Arbelbide 1997). Common deciduous trees and shrubs in riparian areas include black cottonwood (*Populus trichocarpa*), white alder (*Alnus rhombifolia*), willow (*Salix spp.*), and rocky mountain maple (*Acer glabrum*) (Bell 1988).

Wetland habitats on the UIR have decreased in the past 100 years, but the loss is difficult to quantify. Many wetlands in agricultural areas have been filled to increase tillable acres (Quigley and Arbelbide 1997). Based on limited analysis conducted by the CTUIR (1997), wetland losses in the upper Umatilla River range from 30 to 35 percent. The majority of wetlands are associated with riparian corridors and floodplains of the Umatilla River and its tributaries. These wetlands are primarily classified as palustrine and riverine systems and have a connection with surface water stream channels.

Fire Management

Fire Regimes and Fire Effects

Fire regimes are descriptions of the nature of fires occurring over an extended period of time. Fire regimes typically include information on the frequency and severity of fires by major vegetation type. An average fire return interval is estimated for each fire regime and is defined as the average number of years between fire occurrences on a given piece of land. Fire return intervals are calculated for "natural" conditions and do not include the effects of fire suppression. Fire (burn) severity is a qualitative assessment of the heat pulse directed toward the ground during a fire. Fire severity is representative of residual burning during and after the main fire front passes and is effected mainly by surface fuel loading. Low severity fire regimes have 20%

or less of the basal area removed by a fire while stands in high severity fire regimes have 70% or more of their basal area removed (Agee 1990; 1993). Fire (line) intensity is the heat released per unit of time for each unit of length of the leading fire edge. Intensity is represented as follows: (1) low - zero to two foot flame length; (2) moderate - two to six feet flame length; and (3) high - six feet or more flame length. The amount of fire intensity (flame length) in the flaming front is largely dependent on the amount of moisture in the zero to three-inch diameter fuels at the time of the fire.

There are seven general groupings of fire regimes: 0 - no natural fire (or very little); 1 - infrequent light surface fire (more than 25 year intervals); 2 - frequent light surface fires (1-25 year return intervals); 3 - infrequent, severe surface fires (more than 25 year return intervals); 4 - short return interval crown fires (25-100 year return intervals); 5 - long return interval crown fires and severe surface fires (100-300 year return intervals); 6 - very long return interval crown fires and severe surface fires (over 300 year return intervals) (Agee, 1993).

Fuel represents the whole array of combustible material in the forest including: (1) aerial (ladder fuels) - limbs, branches, foliage, lichens, and snags; (2) surface - shrubs, all down woody material, litter, stumps, seedlings and saplings, and grasses; (3) ground - duff, roots, and decomposing logs. Fires that climb vertically through continuous fuels (ladder fuels) from the surface up into aerial fuels are called crown fires. The potential for a crown fire to occur, based on stand structure, crown closure, and surface fuel models, can be described as: (1) null - no chance of crown fire; (2) low - ground/surface fire with occasional torching; (3) moderate - passive, torching occurs; (4) high - active, fire readily consumes the crown sustained by the heavier surface fuel loading; and (5) extreme - independent, fire moves through the crowns of the tree canopy apart from surface fire.

Ponderosa Pine - Fire Regimes 1 and 2 (Dry Upland Forest PVG)

Ponderosa pine is a fire dependent species, which requires frequent surface fires in order to maintain stand health. As a result, ponderosa pine communities have evolved properties that encourage recurrent, low intensity burning. Resinous pine needles provide an abundant yearly accumulation of highly flammable fuel. Despite such characteristics, fire frequencies for ponderosa pine under natural fire regimes vary greatly (Agee, 1993).

Ponderosa pine has developed a number of fire adaptive traits which help to minimize fire damage to tissues. Whereas low intensity fires readily kill seedlings, thick, exfoliating bark and a deep rooting habit make larger trees quite tolerant of most ground fires. The potential for crown fires is lessened in mature individuals due to a tendency to self-prune lower branches, thereby spatially separating foliage from burning ground fuels. Propagation of flames into the crown is further discouraged by long needles which are loosely arranged within an open structured crown. In addition, the foliar moisture content is relatively high (28 to 36%). Trees subjected to dormant season burning are often able to survive extensive crown scorch damage since buds are large and enclosed within thin, insulative bud scales.

Fire plays a crucial role in the regeneration of ponderosa pine by exposing bare mineral soil and removing competing vegetation. Although these conditions are considered optimal for the

germination and establishment of ponderosa pine, postburn establishment is largely successful only when a good seed crop coincides with above average rainfall. Assuming the above conditions are met, seedbed continuity determines whether regeneration appears as dense stands, separated thickets or scattered individuals. Recurrent underburning acts to maintain a very open stocking of trees by reducing numbers of seedlings, removing dense understories of sapling or pole-sized stands, and thinning low vigor overstory trees.

The effect of fire on ponderosa pine is generally related to fire intensity, tree size, and tree density. Low intensity fires readily kill seedlings less than 12 inches in height. Perhaps because of their inherent ability to withstand high soil surface temperatures, larger ponderosa pine seedlings can sometimes survive heat generated by low intensity surface fires. In addition, seedlings frequently escape ground fires by virtue of their establishment in areas where fuels are discontinuous; ground fuel buildups in seedling stands are typically unable to carry fire until trees are 6 to 8 years old. Trees within the young age classes (i.e., larger seedlings, saplings and poles) are only damaged by low intensity fires which generally act to thin regeneration stands of both low vigor trees and also shade tolerant species.

Pine saplings are more fire resistant than comparatively aged Douglas-fir saplings due to such attributes as larger buds, thicker twigs, and the early development of an outer layer of corky bark. Hall (1976) found a layer of dead bark .12 to .25 inches thick in trees only 2 inches in diameter. Although low intensity fires may leave pines 6 to 8 feet tall unharmed, prescribed burning is not usually recommended as a means of pre-commercially thinning regeneration stands where trees are less than 10 to 12 feet in height. Beyond the pole stage, ponderosa pine is quite resistant to the majority of ground fires.

Douglas-Fir - Fire Regimes 2, 3, and 4 (Dry and Moist Upland Forest PVG)

Douglas-fir is more fire resistant than many of its associates and can survive moderately intense fires. Thick, corky bark on the lower bole and roots protects the cambium from heat damage. In addition, the tall trees have their foliage concentrated on the upper bole, which makes it difficult for fire to reach the crown. However, it should be noted that trees are typically not free of lower branches up to a height of 33 feet until they are more than 100 years old.

When trees are killed, Douglas-fir relies on wind-dispersed seed from off-site trees to colonize the burned area. If catastrophic fires are extensive, a seed source may be limited due to the lack of seed trees. Under these circumstances, seeds come from mature trees that survive fire, survivors in small-unburned pockets, or from trees adjacent to the burned area. Where seed trees are scarce, it may take 100 years or more for Douglas-fir to restock the burned area. On the other extreme, when fires do not kill all the trees in a stand, seedling establishment may begin within a year or two after burning. Mineral soils exposed by fire are generally considered favorable seedbeds.

Crown fires commonly kill all trees over extensive areas. Hot ground fires that scorch tree crowns and char tree boles kill variable proportions of Douglas-fir. Rapidly spreading ground fires tend to inflict more damage to Douglas-fir crowns, while slow spreading ground fires are damaging to the bole and can kill trees through cambial heating. Crown scorching from summer

fires is more damaging than fall fires because more buds are killed. During late summer, the buds are set and subsequent-year needles are well protected. Seedlings and saplings are even susceptible to, and may be killed by, low-intensity ground fires.

Temperatures in excess of 140 degrees F (60 degrees C) are lethal to Douglas-fir seeds. Thus, most seeds on the forest floor will be destroyed by fire. Crown fires will kill seeds in green cones; however, green cones are relatively good insulators and are not highly flammable, and fires that are not excessively hot often only scorch the cones. Seeds can mature in scorched cones on fire-killed trees and later disperse onto the burned area.

Grand Fir - Fire Regimes 3 and 4 (Moist and Cold Upland Forest PVG)

Sapling and pole-sized grand fir have thin resinous bark that provides little insulation for the cambium and shallow roots that are susceptible to soil heating. Because of its shade tolerance, grand fir is slow to self-prune lower branches. These low growing branches, which have slender twigs and finely divided foliage, easily ignite from burning undergrowth. Consequently, young grand fir is often killed even by low-intensity surface fires (Zouhar 2001).

At maturity, grand fir develops thick enough bark (about 2 inches) to provide some resistance to low and moderate intensity fires. However, mature grand fir does not survive high intensity surface or crown fires. Its low, dense branching habit, flammable foliage, and tendency to develop dense stands with heavy lichen growth, increase the likelihood of either individual tree torching and/or development of a crown fire.

Lodgepole Pine - Fire Regimes 3 and 4 (Moist and Cold Upland Forest PVG)

Lodgepole pine bears both open and closed cones. This trait allows for lodgepole pine to regenerate following both low and high intensity fire. Serotinous cones are advantageous for regeneration following high intensity fires because the heat opens the cones and then releases the seeds. Up to 10 years of annual seed production are stored in serotinous lodgepole pine cones. This huge seed reserve blankets the exposed forest floor within three years after a fire and can explain heavy concentrations of seedling and sapling trees. Conversely, ground fires generate insufficient heat to open serotinous cones. Following this type of fire, seed for regeneration must come from surviving, non-serotinous cones.

Fire regimes in lodgepole pine dominated communities vary, but in areas having dry summers, low to medium intensity ground fires occur at intervals of 25 to 50 years. In areas with moist summers, sparse understories and slow fuel build-up result in less frequent but more intense fires. Fires can smolder in duff for extended periods or can develop into rapidly spreading wildfires. Smoldering fires are common in lodgepole forests because understory fuels are sparse. Fire spread to the crowns is difficult because they are well elevated above the forest floor. However, lodgepole pine stands become more flammable as they age because dead woody fuels accumulate on the forest floor.

Lodgepole pine is damaged more by ground fires than thicker barked species such as ponderosa pine or Douglas-fir. Because its thin bark has poor insulation properties, many trees are killed

from ground fires as a result of cambial heating. However, some trees survive and, in general, low intensity ground fires thin lodgepole pine stands.

Although lodgepole pine trees are killed by all but light ground fires, postfire recovery tends to be rapid as new stands quickly establish from seed released from serotinous cones (Anderson 2003).

Engelmann Spruce - Fire Regimes 3 and 4 (Moist Upland Forest PVG)

Engelmann spruce is easily killed by fire due to: (1) its thin bark that provides little insulation for the cambium; (2) a moderate amount of resin in the bark which ignites readily; (3) shallow roots which are susceptible to soil heating; (4) low growing branches; (5) moderately flammable foliage; and (6) heavy lichen growth. Surface fires are often lethal because fine fuels are often concentrated under mature trees and burn slowly, girdling the bole or charring shallow roots. Engelmann spruce is often restricted to cool moist sites, restricting the period of time stands can burn.

Current Conditions

Dry Upland Forest PVG

Historic fire behavior was variable with short interval, low to moderate severity, fire regimes. As a result of fire exclusion, these forests are likely to burn with extreme fire behavior, with higher intensity surface fires, and higher consumption of ground fuels due to altered arrangements and amounts of fuels. Lower and mid story stand density has increased, leading to horizontal and vertical fuels increases. Excessive mortality of overstory trees and damage to soils are likely. Forests with low to moderate severity fire regimes experience more adverse ecological effects from high intensity and/or highly consumptive wildfires.

Moist and Cold Upland Forest PVG

An increase in tree density coupled with a shift to more shade tolerant species composition is visible in historic changes in these potential vegetation groups. The duration and intensity of insect outbreaks appears to have increased with the shift in species composition. Due to fire exclusion, wildland fires in this altered ecosystem will now be of higher intensity and severity than historically would have occurred because stand density contributes greatly to vertical continuity and surface fuel buildup. Historically, fire created a complex mosaic of underburns, thinned stands with large residual trees, and stand replacement patches.

Fuel Models

There are two Fire Management Units delineated within the forested area of the UIR: (1) Foothills FMU and (2) Uplands FMU that roughly correspond to the Blue Mountain Slope and Blue Mountain Uplands landforms. Fuel Models that best represent how wildland fire would

behave were derived through LANDFIRE (Keane et al. 2002). Interpretation and calibration of satellite imagery based on local knowledge resulted in the identification of the number of acres in each of the thirteen standard Fire Behavior Fuel Models (FBFM) (Figures 2-5 and 2-6). FM 1 and FM 2 (grasses) surround timber stringers with predominately FM 9 (pine needle cast medium litter) and FM 10 (heavy timber litter). FM 10 has high concentrations of horizontal dead and down fuels and vertical ladder fuels for fire to climb into the overstory, increasing mortality as well as spotting.

Fire History

All Fires 1972-2004

The Wildland Fire Management Information (WFMI) database includes records for 617 fires in the period 1972 through 2004 on the UIR. Human caused fires totaled 578 with approximately 7,000 acres burned. Major contributors include train operation and track maintenance of the Union Pacific Railroad Company's main line, over-heating of vehicles and/or their brakes, harvesting of agricultural crops and removal of crop residue, and removal of debris around homesites. Only 39 lightning ignited fires occurred during this time period totaling approximately 4,000 acres. Almost all lightning fires were less than one acre in size due to the aggressive suppression efforts by the Oregon Department of Forestry and BIA**.**

Large Fires 1996-2008

Aggressive fire suppression efforts have been effective in limiting growth of fires. From 1996-2008 only two large fires occurred in forested areas of the UIR. The Deadman's Pass Fire in August 2000 resulted from off-road vehicle use and consumed 354 acres of grassland and forest stands. A Type 2 Interagency Management Team was needed to contain and suppress the fire. The Wildhorse Creek Fire in August 2008 resulted from a lightning strike and consumed 400 acres of grassland and forest stands. An Oregon Department of Forestry Incident Management Team was needed to contain and suppress the fire.

During the same period, the Umatilla National Forest, adjacent to the UIR, experienced several large fires. In 1996, on the North Fork John Day Ranger District, the Bull, Tower, and Summit Fires consumed thousands of acres. In 2007, the Ukiah Complex Fire on the North Fork Ranger District and the Monument Fire on the Heppner Ranger District burned several thousand acres. On the Pomeroy Ranger District, the School Fire in 2005 and the Columbia Complex Fire in 2006 burned thousands of acres. Based on the number of acres in FM 10 on the UIR and the history of large fires adjacent to the UIR, the potential for a large fire to occur on the UIR is high, despite aggressive suppression effort.

Figure 2-5. Fuel Model Types Within The Foothill FMU On The Umatilla Indian Reservation.

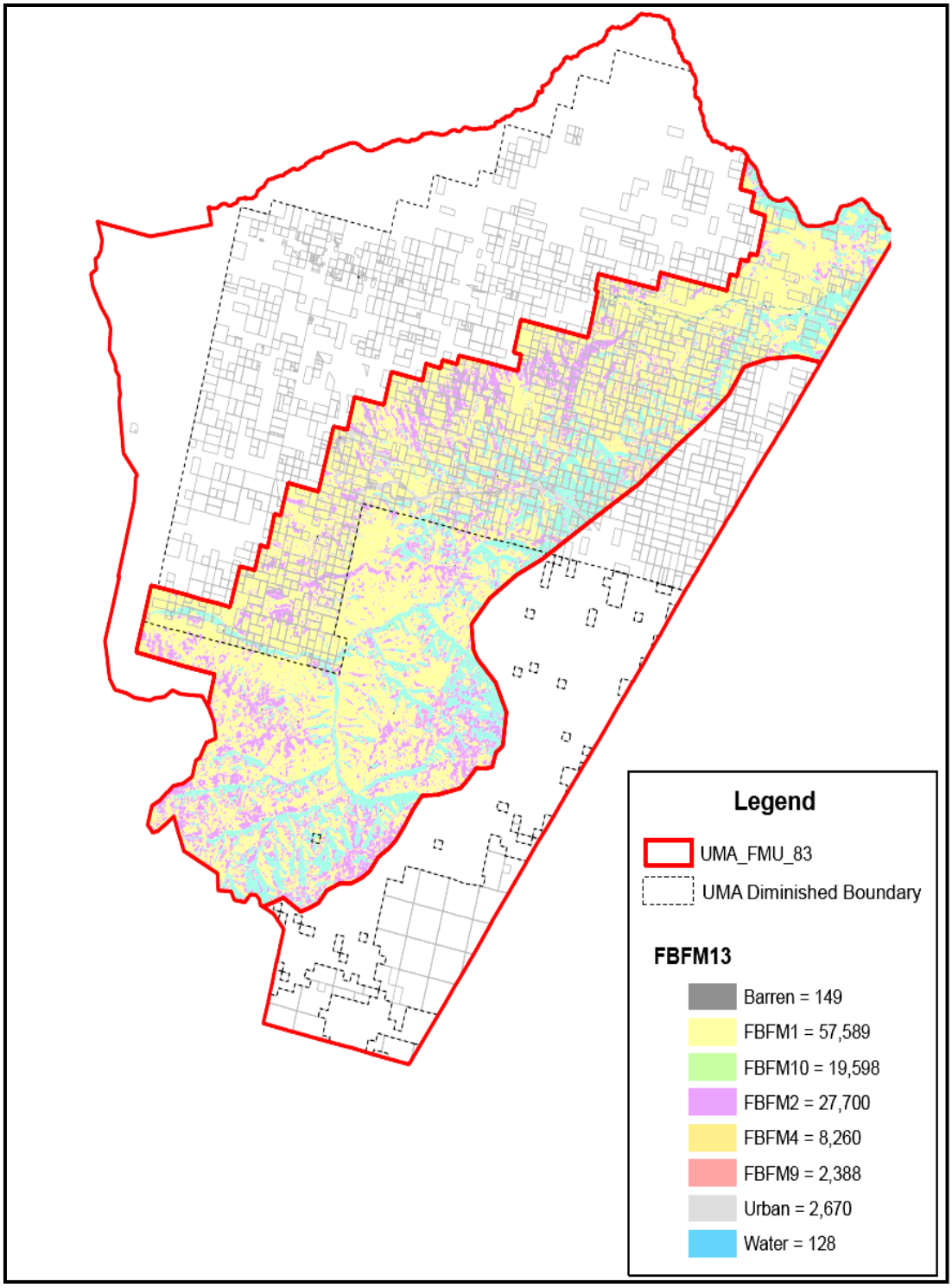
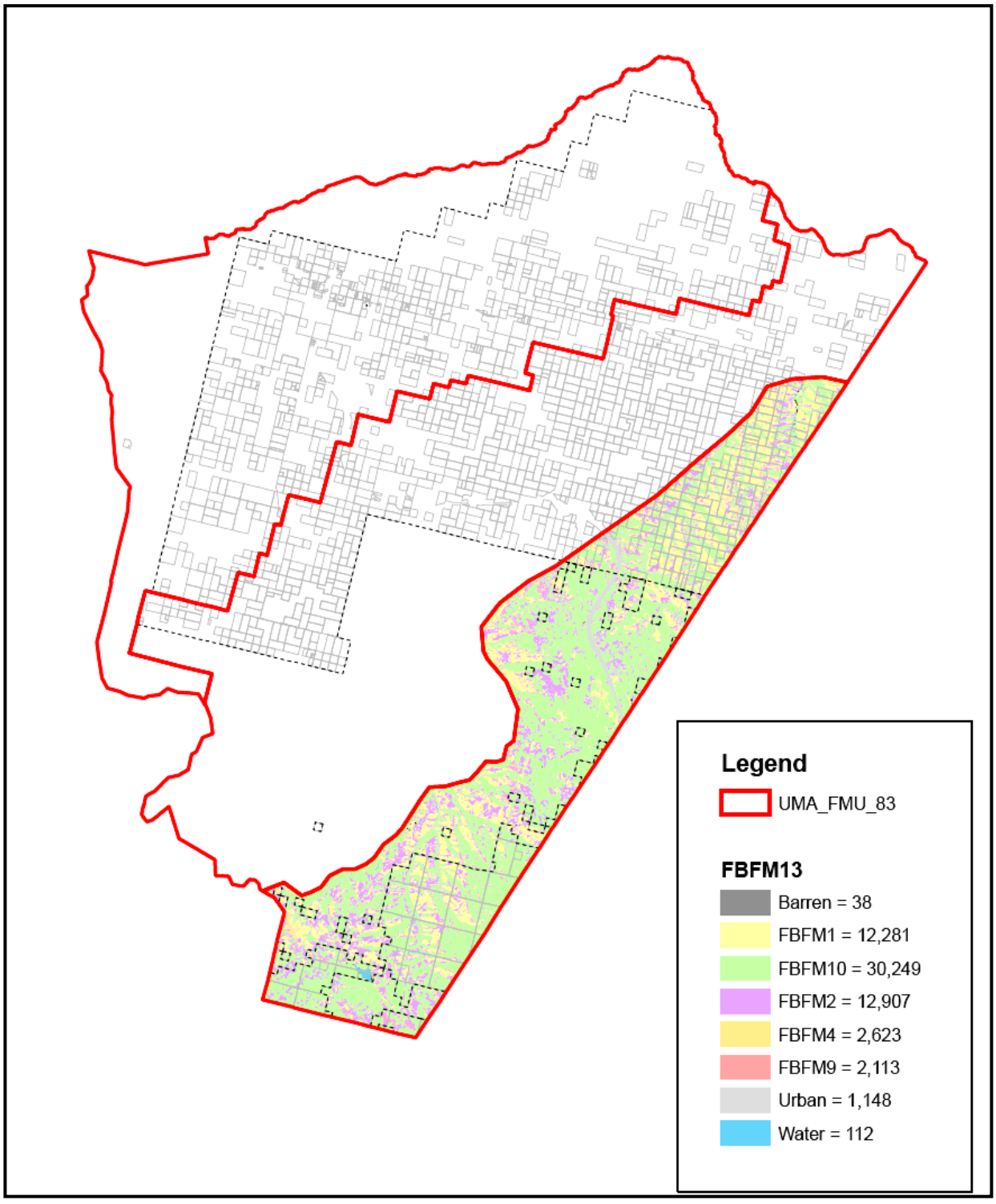


Figure 2-6. Fuel Models Types Within The Upland FMU On The Umatilla Indian Reservation.



Fish Populations

Currently more than 31 species of fish including 17 native species inhabit the Umatilla subbasin (Northwest Power and Conservation Council 2005). Anadromous salmonids that currently occur in the subbasin include summer steelhead (*Oncorhynchus mykiss*), coho (*Oncorhynchus kisutch*), and spring and fall chinook (*Oncorhynchus tshawytscha*). Coho and chinook have been reintroduced from Columbia River hatchery stock, while steelhead are currently supplemented by hatchery-reared fish using wild, endemic broodstock to prevent domestication. Resident salmonid species inhabiting the Umatilla subbasin include mountain whitefish (*Prosopium williamsoni*), redband trout (*Oncorhynchus mykiss*) and bull trout (*Salvelinus confluentus*).

Spring chinook, fall chinook and coho were absent from the subbasin for approximately 75 years. Irrigation and agricultural development in the early 1900's is the primary cause of the decline of steelhead, and directly related to the extirpation of spring chinook salmon (Bureau of Reclamation 1988; ODEQ 2001). Their reintroduction and supplementation occurred in conjunction with actions designed to reconstruct diversion structures and augment flows (ODEQ 2001).

Spring Chinook Salmon

The Umatilla River is believed to have once supported large runs of spring chinook salmon, but the populations have since gone extinct (CTUIR and ODFW 1990). Van Cleve and Ting (1960) reported that there was a large return of chinook salmon in 1914 and that Indians and non-Indians caught thousands and thousands of salmon from spring to fall. The last sighting of the Umatilla run of spring chinook was in 1963 (ODFW 1986).

Spring chinook were reintroduced to the subbasin beginning in 1986 using Carson stock (CTUIR and ODFW 1990). The current management objective is to return 8,000 adult spring chinook salmon to the Umatilla River (excluding ocean and out-of-basin harvest). The objective is to allow an escapement of 3,000 fish for natural spawning, take 1,000 fish for broodstock and harvest the remaining 4,000. The spring chinook population is considered a key species because of its historical presence, recently demonstrated natural production potential and its tribal and non-tribal cultural significance.

The number of adult spring chinook returning to the Umatilla River has fluctuated in recent years with returns of greater than 2,000 adults in 1990, 1996 and 1997 and greater than 4,000 adults in 2000, 2001, 2002, 2003, and 2006. The highest returns are still below the objective of 8,000 adults.

Returning adult hatchery spring chinook have been allowed to spawn naturally in the Umatilla River. Returns from natural spawners began in 1996 and have increased to over 300 in 2000. There is an estimated 1,549 acres of spring chinook spawning and rearing habitat in the Umatilla subbasin (CTUIR and ODFW 1990). The United States vs. Oregon Production Report estimated

the chinook natural production capacity at 43,500 smolts and 870 adults (CTUIR and ODFW 1990).

Quality spawning areas are limited to the North Fork Umatilla River and the mainstem Umatilla River above RM 79. The number of redds observed and the estimated egg deposition has fluctuated through the years and has been determined by the number of adults available for spawning and their rate of survival to spawning. Spawning surveys indicate that survival to spawning is often well above 90 percent in the quality headwater habitat, but can be very low in the marginal habitat. During the last three years, more and more adult spawners have been observed in the quality spawning habitat in the headwaters. Most spawned-out carcasses of naturally produced adults are observed in quality headwater habitat, and their numbers are increasing. A portion of the naturally spawning hatchery adults select marginal habitat with warm water temperatures and have poor survival to spawning.

Estimates of juvenile spring chinook rearing in the Umatilla subbasin are based on the amount of suitable rearing habitat estimated during basin-wide habitat surveys, densities observed at annual index sites and intensive biological sampling in primary rearing areas. CTUIR estimated only 50,000 naturally produced juvenile chinook reared annually during the summer low flow periods from 1993-1996 (Contor et al. 1996).

Only in 1993 did significant adult spawning escapement occur during the brood years from 1992 to1995. From 2000 to 2002, spawning escapement and success was greater and the abundance of juvenile chinook was much higher than normally observed (Contor 2004). From natural population estimates (1999-2002), biologists identified that the areas with the highest densities of spring chinook were from RM 64.2 to RM 89.6 of the Umatilla River and in the North Fork Umatilla (Contor 2004).

The distribution of the majority of juvenile spring chinook rearing habitat is limited to the North Fork Umatilla River and the mainstem of the Umatilla River above the mouth of Meacham Creek. However, juvenile spring chinook are also found in low numbers in the more favorable reaches of many of the tributaries used by juvenile steelhead (Contor 2004). The abundance and distribution of naturally produced juvenile spring chinook during the summer is variable. The number of successful spawners the previous year and the extent of stream habitat with suitable water temperatures varies considerably (Contor 2004).

Fall Chinook Salmon

Fall chinook salmon are believed to have returned to the Umatilla subbasin and were known to be captured from spring through the fall by Native Americans and early settlers. Natural production potential is theoretically large based on the juvenile life history patterns.

State and Tribal authorities began hatchery releases of fall chinook salmon in 1982 with Tule stock, and switched to Upriver Bright stock in 1983 (CTUIR and ODFW 1990). The suitability of the Umatilla subbasin for the natural production of fall chinook in its current condition has remained a critical uncertainty. Returns of hatchery produced fall chinook have often been low

with the largest return in 2004 of 4,127. Production of fry has also been documented, even though redds have been scoured by high flow events and impacted with fine sediment (Contor 2004). ODFW (Knapp et al. 2000) estimated that 141,000 fall chinook fry migrated from the Umatilla River in 1998. Fry survival has been severely compromised by warm water temperatures during outmigration below Westland Dam, where most of the early summer flows are extracted. Additional water has been released into July during the last several years to assist downstream migration and enhance survival.

Coho Salmon

Coho salmon were released from 1966 through 1969 and from 1987 to the present, and have been primarily Tanner Creek stock. Broodstock for the program are collected at Bonneville Hatchery and reared at Cascade and Lower Herman Creek Hatcheries. Some broodstock have been collected from the Umatilla River at the Three Mile Falls adult trap during several recent years due to broodstock shortages at Bonneville. Smolt releases have been variable but the current program releases 1,500,000 smolts annually into the mainstem Umatilla River.

Returns to Three Mile Dam have been variable and have ranged from 356 fish in 1992 to 23,334 fish in 2001. More than 9,000 coho salmon returned in both 2003 and 2004 and 1999.

Spawning survey crews have observed many coho redds and spawned-out adult carcasses through the years in the Umatilla River from the mouth to Meacham Creek. Water conditions often prevent extensive and accurate counts but redds and carcasses are observed each year. Coho have been observed in low numbers in some of the mid-basin tributaries such as Isqúulktpe Creek, Buckaroo Creek and Meacham Creek. Naturally produced juvenile coho have been observed throughout the lower mainstem and in the lower portions of many of the mid-basin tributaries (McKay Creek, Mission Creek, Moonshine Creek, Buckaroo Creek, Isqúulktpe Creek, Tutuilla Creek and others).

Mountain Whitefish

CTUIR monitoring and evaluation crews have observed mountain whitefish throughout the mainstem of the Umatilla River in low abundance (RM 0-90). Mountain whitefish comprised 6% of salmonids collected during electrofishing surveys during the summer of 1995 from the upper portion of the Umatilla River (RM 82-90). CTUIR has also observed a low abundance (<0.2% of salmonids) in Meacham Creek and the Umatilla from RM 60 to 82 during the summer of 1993. During the winter and spring, several mountain whitefish have been observed at Westland Dam (RM 29) and in backwaters near the mouth. Some adult mountain whitefish remain in the lower river during the summer in cool water refuge areas as 12 (267-408 mm) were collected during surveys in 1996 from RM 1 to RM 52 during June, July and August of 1996 (Contor 2004).

Lamprey

Historically, Pacific lamprey (*Lampetra tridentata*) were abundant in the Umatilla subbasin (Close et al. 1995; Close 2000; Jackson et al., 1997). The Umatilla River was primarily utilized for fishing by the Umatilla, Cayuse, Nez Perce and Columbia River Tribes (Swindell 1942; Lane and Lane 1979). Much of the lamprey harvest occurred at the current site of Three Mile Dam prior to construction of the dam. Harvest also occurred in the North and South Forks of the Umatilla River (Swindell 1942; Lane and Lane 1979).

Pacific lamprey populations in the Umatilla River basin are depressed. In 1986, 1988-90, and 1992-94, records show that no juvenile lamprey were captured at any of the screen-trap boxes in this subbasin. An ODFW screen trap operator stated that no lamprey were captured in 1997 and 1998 in the Umatilla River basin. From December 1994 to May 1996, eleven adults and 57 juveniles were sampled by ODFW at a rotary-screw trap (RM 1.0) below Three Mile Falls Dam, and at West Extension Irrigation District canal at Three Mile Falls Dam (RM 3.7). In 1997, ODFW captured 298 juvenile Pacific lamprey in the rotary-screw trap. From September through October 1998, CTUIR staff captured nine ammocoetes below RM 6. In 1997 and 1998, CTUIR did not capture any adult Pacific lamprey at the Three Mile Falls Dam adult trap. CTUIR staff observed one adult Pacific lamprey at Westland Irrigation Diversion (RM 27) in July of 1996, and 12 adult Pacific lamprey in the ladder at Three Mile Falls Dam during dewatering in April 1996. Technicians have observed one or two adult Pacific lamprey several times per year in the viewing window and ladder at Three Mile Falls Dam during spring operations.

Shellfish

Shellfish were an important food for tribal peoples of the Columbia River. Native Americans in the interior Columbia River Basin harvested freshwater mussels for at least 10,000 years (Lyman, 1984). Ethnographic surveys of Columbia Basin tribes reported that Native Americans collected mussels in late summer and in late winter through early spring during salmon fishing (Spinden 1908; Ray 1933; Post 1938). A few tribal elders from the Columbia and Snake River basins recalled that mussels were collected whenever conditions of the rivers were favorable (Hunn and Selam 1989). Tribal harvesters collected mussels by hand and, when wading was not possible, they used forked sticks (Post, 1938). They prepared mussels for consumption by baking, broiling, steaming, and drying (Spinden 1908; Post 1938).

Wildlife/Wildlife Habitat

Of the 378 species of vertebrates in the Blue Mountains, approximately 200 are associated with forested habitats known to occur on the UIR (Thomas 1979). For the purpose of later analysis of the potential effects to wildlife and wildlife habitat, wildlife species were placed into functional groups of animals with similar life histories. Since functional groups contain multiple species, focal or indicator species were selected from each group. There are several functional groups

present on the UIR: managed species (ungulates), forest associated species, and wetland and riparian associated species.

Managed Species

Rocky Mountain Elk

Based on nationwide forest statistical reports, the Umatilla National Forest supported one of the largest Rocky Mountain elk herds in the country during the 1970's and 1980's (U.S. Forest Service 1990). Portions of the Oregon Department of Fish and Wildlife (ODFW) Mt. Emily and Ukiah Wildlife Management Units (WMU) overlap the UIR. Currently the winter population estimate for the Mt. Emily WMU is 3,000 elk or 53% of the management objective while the population estimate for the Ukiah WMU is 4,400 elk or 80% of the management objective. Elk that normally winter in the Grande Ronde subbasin may migrate to and winter in the Umatilla subbasin during severe winters (Kirsch pers. comm.).

Elk that winter on the UIR primarily summer in high elevation publicly owned forest lands. In the winter, elk move into the lower elevation foothills. The UIR contains approximately 11,150 acres of satisfactory cover and 6,450 acres of marginal cover for Rocky Mountain elk.

Mule Deer and White-tailed Deer

Both mule deer and white-tailed deer occur on the UIR. Mule deer dominate in upper elevation forested habitats and arid lowland areas. White-tailed deer are the dominant deer species in riparian areas with a constant flowing water source and in foothill areas with hawthorn groves in the draws and hillsides. However, the extreme susceptibility of white-tailed deer to blue tongue disease contributes to a separation between habitats used by the two species. White-tailed deer are usually not found in arid habitats due to the prevalence of blue tongue disease in these environments (Williams and Barker 2000).

Mule deer populations, 13,300 animals, for the Mt. Emily and Ukiah WMU are slightly below ODFW's management objective of 13,500 animals. Mule deer populations in Oregon peaked during the mid-1950's and early 1960's, but have declined since then.

Forest-Associated Species

Approximately 25,153 acres of the UIR consist of forested habitat. Changes in composition and structure of forested habitats over time have negatively impacted habitat suitability for many forest-dependent species. Species of concern dependent on forest habitat types that may inhabit the UIR include the northern goshawk, northern pygmy owl (*Glaucidoium gnoma*), flammulated owl (*Otus flammeolus*), great gray owl (*Strix nebulosa*), olive-sided flycatcher (*Contopus borealis*), pileated woodpecker (*Dryocopus pileatus*), and black-backed woodpecker (*Picoides articus*) (Csuti et al., 1997). The white-headed woodpecker (*Picoides albolarvatus)*, Lewis' woodpecker (*Melanerpes lewis*), and McGillvray's warbler (*Oporornis tolmiei*) depend on a variety of forest types and structures and may occur on the UIR.

Northern Goshawk

Northern goshawks are typically found in coniferous forests, but will also use quaking aspen groves. These are large accipiters that prefer large patches of late-successional forests with large trees and considerable canopy closure for nesting. Northern goshawks forage in a mixture of habitats including young forests and small openings. Northern goshawks build nests of sticks that are located in the fork of a limb in a large tree, usually between 20 and 80 feet off the ground. Goshawks are territorial and usually defend several hundred acres.

Northern Pygmy-Owl

The northern pygmy-owl is unlike other owls in that it is typically active during daylight hours. It is found in mid to late seral conifer and ponderosa pine forests in summer and shrub and riparian vegetation in winter. The northern pygmy-owl uses abandoned woodpecker holes for its nest. Forest practices that remove snags containing woodpecker holes may be reducing available nest sites for this species in Oregon (Gilligan et al. 1994).

Flammulated Owl

The current status and distribution of the flammulated owl on the UIR is unknown. Flammulated owls are broadly distributed throughout the Blue Mountains Ecological Reporting Unit (ERU), although the availability of source habitats for the species has declined (Wisdom et al., 2000). Flammulated owls depend on late seral ponderosa pine forests with high densities of snags, typically nesting in cavities abandoned by northern flicker and pileated woodpecker (Marshall et al. 1996).

Great Grey Owl

Great grey owls are found in mixed conifer, ponderosa pine, and lodgepole pine forests. They are most often found in old-growth (north facing slopes) forests. Nest sites are in large diameter (> 20 inches DBH) dead trees in cavities or on platforms. They forage over open areas such as meadows and clearcuts in forests.

Olive-sided Flycatcher

The olive-sided fly catcher prefers coniferous forests with tall trees and snags that provide an overview of its territory. Open forests are preferred. There is little known about the spatial requirements of this species, but it seems to be declining throughout its range in Oregon (Gilligan et al. 1994).

Pileated Woodpecker

Pileated woodpeckers have large home ranges, typically over 1,000 acres. Although the pileated woodpecker will forage in open areas, it requires older forests (greater than 70 years of age) for nesting. In eastern Oregon, the pileated woodpecker is found in old-growth ponderosa pine-mixed conifer forests.

Black-backed Woodpecker

The black-backed woodpecker is generally found in forests dominated by ponderosa pine. Nests are typically found in ponderosa or lodgepole pine, or western larch. Black-backed woodpeckers feed mainly on wood-boring beetles and their larvae. Nest trees are often located at the edges of clearings and near water.

White-headed Woodpecker

The current status and distribution of the white-headed woodpecker on the UIR is undetermined. However, the woodpecker occurs throughout the Blue Mountains (ERU) (Wisdom et al., 2000). Gabrielson and Jewett (1940) reported this bird was a regular permanent resident of the large structure ponderosa pine forests of eastern Oregon. However, severely degraded habitats have now made sightings of this bird scarce (Gilligan et al., 1994). Approximately 19 of the 54 5th field HUC's in the Umatilla/Willow subbasin historically contained source habitat for the white-headed woodpecker according to ICBEMP analysis. Source habitats in 14 of these 19 HUC's have declined, in 12 HUC's by ≥ 60% (Wisdom et al. 2000).

Lewis's Woodpecker

The current status and distribution of Lewis's woodpecker on the UIR is undetermined. However, the woodpecker has been known to occur in or adjacent to the Umatilla/Willow subbasin. Preferred habitat for the woodpecker includes open riparian cottonwoods with a brush understory. It is an excellent focal species for large structure riparian cottonwood stands with associated large snags (Altman and Holmes 2000a; 2000b).

McGillivray's Warbler

Regionally, the McGillivray's warbler has exhibited a non-significant short-term (1980-1996) declining trend of 2.1% per year (Altman and Holmes 2000a; 2000b). The current population status and distribution of McGillivray's warbler on the UIR is undetermined. However, the warbler has been documented numerous times in or adjacent to the Umatilla/Willow subbasin over the last few years (Pyle et al. 1999). Preferred habitat for the warbler includes mixed conifer forests with a dense shrub layer in openings or understory (Altman and Holmes 2000a; 2000b). The McGillivray's warbler is vulnerable to cowbird parasitism in areas where habitat fragmentation has allowed cowbirds to colonize. Reductions in shrub cover due to grazing intensity, wildfires, herbicide treatments, and prescribed burns can reduce the suitability of habitats for the McGillivray's warbler (Altman and Holmes 2000a; 2000b).

Wetland and Riparian-Associated Species

Declines in the quality and quantity of wetland habitat in the subbasin have negatively impacted the wildlife populations that depend on this habitat type. The spotted frog (*Rana pretiosa*) and western toad (*Bufo boreas*) are listed as sensitive by ODFW. Of these, the spotted frog is

sublisted as critical, while the western toad is considered vulnerable and peripheral or naturally rare (Marshal et al. 1996).

Spotted Frog

The current status and distribution of the spotted frog in the Umatilla/Willow subbasin is undetermined. However, the frog occurs sporadically throughout the Blue Mountains. The spotted frog has occasionally been observed in the middle and lower elevations of the subbasin since 1995. Preferred habitat for the frog consists of marsh, permanent ponds, and slow streams with abundant aquatic vegetation (Marshal et al. 1996). Suitable habitat for the spotted frog can be found in the Umatilla/Willow subbasin along numerous streams and a few wet meadows or seeps. The spotted frog was formerly considered threatened in western Oregon by ODFW, but subsequently sublisted to critical due to lack of documentation on its disappearance.

Western Boreal Toad

The western boreal toad (western toad) is found in a wide variety of habitats ranging from deserts, grasslands, woodlands, and forests. They require water for breeding across all habitat types. The western toad breeds from February to July. The western toad has adapted to human-modified environments and can be very abundant (Marshall et al. 1996; Samallow 1980; Schonberger 1945; and Smits 1984).

Snag and Down Wood Habitat

Historical information for snag and down wood habitat on the UIR is not available. In general, snags and down logs were likely most common in mixed conifer and true fir stands but less common in fire-regulated pine communities. Numbers of snags and down logs fluctuated with the level of natural mortality and the frequency and intensity of large scale disturbances such as fires, insect epidemics, and drought induced mortality. In the context of wildlife habitat, the distribution, condition and size of individual snags and logs is more important that the total biomass of dead wood.

Snags and woody debris are most common in old and mature forests that have declined in the region (Quigley and Arbelbide 1997; U. S. Forest Service 1990). Available data indicates the size distribution of trees on the UIR is similar to the size distribution of trees on adjacent national forest lands. Information derived during the 2003 Continuous Forest Inventory on the UIR revealed that 73% of trees fell into the sapling size class (1.0-5.0 inches DBH). Pole timber size class trees (5.1-8.9 inches DBH) and sawtimber size class trees (≥9.0 inches DBH) comprised 10% and 17%, respectively, of all trees (Haberstroh pers. comm.). The most recent information on forest resources of the Umatilla National Forest revealed that 66% of trees fell into the sapling size class. Pole timber size class trees and sawtimber size class trees comprised 16% and 17%, respectively, of all trees (Christensen et al. 2007). On the UIR, small sawtimber sized stands (9.0 to 19.9 inches DBH) are predominate on 69% of the forest land area while large sawtimber sized stands (≥20.0 inches DBH) occupy 17% of forest stands (Haberstroh pers. comm.). On the Umatilla National Forest, small sawtimber sized stands are predominate on 69% of the forest

land area while large sawtimber sized stands occupy 21 percent of forest stands (Christensen et al. 2007). Together, saplings and pole size timber (1.0 to 8.9 inches DBH) occupy the remaining 14% and 10% of timber stands on the UIR and Umatilla National Forest, respectively.

The Umatilla National Forest was found to contain snag densities that met or exceeded the Forest Service established snag density objectives. However, and most importantly, large snags and snags in ponderosa pine forests had a density below Forest Service objectives. Overall high snag densities are attributed to recent insect outbreaks. While total numbers of snags may meet the Forest Service's snag density objectives, because of their small size, many of these snags do not provide the cavity nesting habitat required by most snag dependent wildlife (Christensen et al. 2007).

Available data indicates the density of snags on the UIR may be lower than the density of snags on the Umatilla National Forest. Information derived from the 2003 Continuous Forest Inventory on the UIR indicated an average of approximately 16 snags per acre. When standing dead trees were measured, inventory crews assigned each tree a decay class describing its stage of decomposition. Trees in the first class generally have intact bark and limbs and have little decay of the bole. Trees in the second class have lost some limbs and bark and may have advanced decay of heartwood. Trees in the third through fifth classes have lost most of their bark and limbs and have progressively more decay and loss of the bole's original form. Snags in the first class are assumed to be relatively recent mortality probably dying within the previous five years before plot measurement. (Table 2-12).

Table 2-12. Snags Per Acre On The Umatilla Indian Reservation By Decomposition Class

DBH Class	1 Hard	2 Hard	3 Soft	4 Soft	5 Soft	All Classes
10	2.20	0.25	0.07	0.02	2.40	4.95
12	1.43	0.41	0.11	0.07	1.52	3.53
14	0.90	0.34	0.04	0.01	1.12	2.42
16	0.67	0.17	0.11	0.00	0.71	1.66
18	0.54	0.17	0.07	0.00	0.54	1.32
20	0.49	0.07	0.00	0.00	0.25	0.81
22	0.32	0.00	0.06	0.00	0.07	0.45
24	0.13	0.05	0.01	0.00	0.14	0.33
26	0.07	0.00	0.00	0.00	0.01	0.08
28	0.12	0.03	0.00	0.00	0.02	0.17
30	0.03	0.02	0.00	0.00	0.02	0.06
32	0.02	0.03	0.00	0.00	0.00	0.05
34	0.00	0.00	0.00	0.00	0.00	0.00
36	0.02	0.00	0.00	0.00	0.00	0.02
38	0.00	0.00	0.00	0.00	0.00	0.00
40	0.00	0.00	0.00	0.00	0.00	0.00
Total:	**6.94**	**1.53**	**0.47**	**0.11**	**6.79**	**15.84**

Snag decomposition class definitions:
1 - Hard snag - recent dead, limbs present
2 - Hard snag - few limbs or limb stubs; bark loose or sloughing

3 - Soft snag - limb stubs, some broken; bark sloughing, little bark remaining
4 - Soft snag - decomposed sapwood and heartwood; little or no bark remaining
5 - Soft snag - much of snag on the ground

Overall 44 percent of all snags sampled during 2003 were assigned to the first decay class and are considered to have died within the previous five years. Bull et al. (1997) considered snags most useful for cavity nesting birds to be those greater than 21 inches DBH. Combining all decay classes, there were only approximately 2.0 snags greater than 21 inches DBH per acre on the average on forest lands of the UIR. Species with the highest proportion of snags are Douglas-fir and grand fir. Douglas-fir and western larch are highly prized by individuals gathering firewood for their value as a heat source for their residences. In forest stands of the UIR accessible to vehicles, Tribal members have removed most of the hard snags of these two species.

Threatened, Endangered and Sensitive Fish and Wildlife

Eighteen species of fish and wildlife that are listed as either threatened, endangered, or sensitive (either federally or state) are associated with forested habitats known to occur within the UIR (Table 2-13). NOAA-Fisheries defines an Evolutionarily Significant Unit (ESU) as an anadromous fish population, or group of populations, that is substantially reproductively isolated from other conspecific populations and that represents an important component of the evolutionary legacy of the species. NOAA-Fisheries has designated two ESU's of summer steelhead associated with the UIR as threatened: Middle Columbia River ESU and Snake River Basin ESU. NOAA-Fisheries also designated one ESU of spring chinook associated with the UIR as threatened: Snake River Basin Spring/Summer Runs ESU. In 2005, NOAA-Fisheries designated critical habitat for these ESU's but specifically excluded Indian trust lands from these critical habitat delineations.

Steelhead/Redband Trout

In the last 35 years, adult steelhead returns have fluctuated in the Umatilla subbasin in a similar pattern to steelhead in the John Day and other systems in the region. Endemic Umatilla steelhead are artificially supplemented using wild endemic broodstock to prevent domestication. Hatchery reared steelhead are the progeny of about 115 wild parents taken from a cross-section of the run annually. Between 1986 and 1988, hatchery steelhead comprised roughly ten percent of the adult return (CTUIR and ODFW 1990). Between 1989 and 1996, the percent of the adult run comprised of hatchery fish climbed from 14% to as much as 43%, and in 1997 hatchery fish outnumbered natural fish, comprising 60% of the adult returns. In 1999 and 2000, hatchery fish represented 39.8 and 25.3% of the run, respectively. The hatchery fish are passed above Three-Mile Dam for harvest opportunities and to supplement natural production by spawning naturally.

The CTUIR have conducted, and are currently conducting, a series of Natural Production Monitoring and Evaluation (NPME) studies that include annual surveys of a number of key

Table 2-13. Listed Fish And Wildlife Species Associated With Forested Habitats Of The Umatilla Indian Reservation.

Species Name	Common Name	Status
Fish		
Salvelinus confluentus	Bull Trout	US-T
Oncorhynchuis mykiss	Summer Steelhead	US-T
Onchorhynchus	Spring Chinook	US-T
Amphibians		
Bufo boreas boreas	Western Boreal Toad	OR-SV,US-SC
Rana pretiosa	Spotted Frog	OR-SC
Birds		
Accipiter gentilis	Northern Goshawk	OR-SC, US-SC
Contopus borealis	*Olive-Sided Flycatcher*	*OR-SV, US-SC*
Dryocopus pileatus	*Pileated Woodpecker*	*OR-SV, FS-S*
Glaucidium gnoma	*Northern Pygmy-Owl*	*OR-SC*
Otus flammeolus	*Flammulated Owl*	*OR-SC, US-SC*
Strix nebulosa	*Great Gray Owl*	*OR-SV, FS-S*
Picoides albolarvatus	*White-Headed Woodpecker*	*OR-SC*
Picoides arcticus	*Black-Backed Woodpecker*	*OR-SC*
Sitta pygmaea	Pygmy Nuthatch	OR-SC
Mammals		
Antrozous pallidus	pallid bat	OR-SC
Myotis thysanodes	fringed myotis	OR-SV,US-SC
Plecotus townsendii	Townsends's big-eared bat	OR-SC, FS-S
Lynx Canadensis	Lynx	US-T
Martes Americana	American marten	OR-SV, FS-MIS
Gulo gulo	Wolverine	OR-T, FS-S

Key:

Oregon (OR) Classifications	Forest Service (FS) Classifications	Federal (US) Classification
SC- Sensitive Critical	S-Sensitive	E-Endangered
SV-Sensitive Vulnerable	MIS-Management Indicator Species	T-Threatened
T-Threatened		SC-Species of concern
E-Endangered		

index areas. NPME survey data established the general spawning locations of summer steelhead in the Umatilla River. Spawning occurs in the mainstem of the Umatilla river primarily from Minthorn springs upstream (RM 65) and in the headwater tributaries. However, some spawning has been observed as far downstream as Feed Canal Diversion (RM 28). Major spawning

tributaries include Birch Creek; Meacham Creek; and Isqúulktpe Creek. Hatchery reared endemic summer steelhead are frequently observed digging redds and spawning naturally during spawning surveys (Contor 2004).

CTUIR annually monitors trends in species composition, abundance and rearing density of salmonids at index sites located throughout the Umatilla subbasin. During the summer low flow periods from 1993-1996, CTUIR estimated juvenile steelhead abundance in the primary rearing areas using habitat surveys that estimated suitable stream habitat areas to reach specific steelhead densities derived from extensive sampling using removal-depletion methods. Juvenile natural steelhead abundance in the primary rearing areas was approximately 725,000 during that time period (Contor et al. 1996). These estimates do not include many of the newly emerged fry or smolts that outmigrated prior to the summer sampling period. Of the total 770 miles of stream in the subbasin, 233 miles are estimated to be suitable summer rearing habitat for juvenile steelhead based on salmonid catch, water temperatures and flows (Contor et al. 1996). Surveyors found the highest numbers of juvenile steelhead/mile between RM 81.8 and RM 89.6 of the Umatilla River, and in the tributaries of Birch, Meacham, and Isqúulktpe Creeks (Contor et al., 1996).

Moderate to high rearing densities (20-300+ fish/100m^2) of juvenile steelhead/redband trout were observed during the summer low flow periods in most stream habitat with persistent flow and suitable water temperatures. Steelhead rearing streams include, but are not limited to, Meacham Creek, Isqúulktpe Creek, Buckaroo Creek, Boston Canyon Creek, Mission Creek, Coonskin Creek, and others (Contor 2004).

During the late fall, winter and early spring, juvenile steelhead were observed throughout the basin, including reaches that are often intermittent during the summer. During spring and early summer, juvenile steelhead move into the higher quality habitat areas associated with headwater streams, spring areas and the upper reaches of the mainstem.

Bull Trout

The U.S. Fish and Wildlife Service considers the bull trout population in the Umatilla subbasin a part of the Columbia River Distinct Population Segment, which represents an evolutionarily significant unit. Historically, fluvial bull trout would have had access to the Columbia River and its tributaries and been connected to populations in the adjacent basins, forming a larger metapopulation (Buchanan et al. 1997). Construction of Three-Mile Dam and McKay Dam has impacted the fluvial bull trout population and has prevented access to and from the Columbia River. Construction of mainstem dams further isolated the Umatilla bull trout from neighboring populations in the Walla Walla River (Buchanan et al. 1997).

Because of poor water quality conditions in much of the Umatilla subbasin, bull trout are isolated in the headwaters of the Umatilla River and Meacham Creek (ODFW 2005). Currently, bull trout are found in the mainstem Umatilla River upstream of Thorn Hollow, at elevations above 1,600 feet. Spawning and rearing occurs in the North and South Forks of the Umatilla River and in North Fork Meacham Creek. Annual comprehensive spawning surveys conducted between 1994 and 1996 by ODFW, U. S. Forest Service and CTUIR in known or suspected areas of spawning indicate that the majority (81 to 92 percent) of redds are in the North Fork Umatilla River

between Coyote and Woodward Creeks (U.S. Fish and Wildlife Service 2004). Suitable spawning habitat also exists in the East Fork of Meacham Creek, but to date bull trout have not been found there (Buchanan et al. 1997). Year-round use also occurs in Isqúulktpe Creek, Ryan Creek, North Fork Umatilla River, Coyote Creek, Shimmiehorn Creek, and Meacham Creek, although no spawning has been identified in these areas (Buchanan et al. 1997).

The U.S. Fish and Wildlife Service (2004) defined the bull trout populations in the Umatilla subbasin as comprised of the North Fork and South Fork sub-population and the Meacham Creek sub-population. Buchanan et al. (1997) identified three bull trout populations within the Umatilla subbasin: the North Fork Umatilla, South Fork Umatilla, and Meacham Creek populations. The South Fork and Meacham populations have declined from the 1991 status report (Buchanan et al. 1997) and the persistence of bull trout in the Umatilla was considered tenuous by biologists from the U. S. Forest Service, CTUIR, and ODFW (Table 2-14) (ODFW 2005). Protective angling regulations have been in place since 1989 and the harvest of bull trout closed since 1994. Tribal angling accounts for some harvest, but most Tribal members release bull trout (Buchanan et al. 1997).

Table 2-14. Status Of Bull Trout Populations In The Umatilla Subbasin (1991 Status: Ratliff And Howell, 1992; 1996 Status: Buchanan Et Al., 1997)

Population	1991 Status	1996 Status
North Fork Umatilla River	Low Risk	Of Special Concern
South Fork Umatilla River	Of Special Concern	High Risk
Meacham Creek	Not Identified	High Risk

No adequate population estimates are available for bull trout at this time (Buchanan et al. 1997). The spawning surveys conducted between 1994 and 1998 found less than 100 redds in the Umatilla subbasin, for all areas combined. Biologists attribute the marked increase in bull trout redds in 1998 in part to fishing regulations, introduction of spring chinook (an historic prey of bull trout), public education and changing locations for stocking rainbow in the upper Umatilla River. Redd count surveys of North Fork populations reflect a significant increase during the period 1998 to 2000.

Important information pertaining to the status and production of bull trout in the Umatilla subbasin are limited or absent. Identified data gaps for bull trout include fecundity, sex ratio measures, and survival rates (egg-to-adult).

Canada Lynx

The current population status and distribution of the Canada lynx in the Umatilla/Willow subbasin is unknown. Surveys failed to detect the lynx within and adjacent to the subbasin in 1999 and the species may have been extirpated from the area (Stinson 2000). The secretive nature of the lynx makes it difficult to conclusively establish its presence or absence. The lynx was recently listed as federally threatened and is naturally rare in the subbasin (Stinson 2000). Preferred habitat for the lynx consists of high elevation (> 4,500') stands of cold and cool forest

types with a mosaic of structural stages for foraging and denning. Primary habitat consists of subalpine fir, Engelmann spruce, and lodgepole pine (Ruediger et al. 2000; Ruggiero et al. 1999). Lynx habitat occurs at higher elevations in the forested areas of the subbasin off the UIR.

Sensitive Plant Species

A December, 1988, survey documented 21 sensitive plant species during a survey of 25% of the Umatilla National Forest (Umatilla National Forest 1990) (Table 2-15). This study does not include the UIR, but it is likely that these species may also occur on the UIR.

Table 2-15. Sensitive Plant Species On The Umatilla National Forest (U.S. Forest Service 1990)

Common Name	Scientific Name
Sierra onion	*Allium campanulatum*
Blue Mountain onion	*A. diction*
Swamp onion	*A. madidum*
Flat-leaved onion	*A. tolmiei var. platyphyllum*
Arctic Aster	*Aster sibiricus var. meritus*
Arthur's milkvetch	*Astragalus arthuri*
Transparent milkvetch	*A. diaphanus var. diaphanous*
Moonwort grape-fern	*Botrychium lunaria*
Pond sedge	*Carex limnophila*
Utah thistle	*Cirsium utahense*
Male fern	*Dryopteris filix-mas*
Sabin's lupin	*Lupinus sabinii*
Stiff clubmoss	*Lycopodium annotinum*
Bank monkey-flower	*Mimulus clivicola*
Washington monkey-flower	*M. washingtonensis*
Common twinpod	*Physaria didymocarpa var. didymocarpa*
Blue Mountain buttercup	*Ranunculus oresterus*
Umatilla gooseberry	*Ribes cognatum*
Wenaha current	*R. wolfii*
Scapose catchfly	*Silene scaposa var. scaposa*
Subalpine spiraea	*Spiraea densiflora var. splendens*

Cultural Resources/Traditional Uses

To comply with Section 106 of the National Historic Preservation Act of 1966, as amended, all federally approved, funded or supervised undertakings must be evaluated for their effects upon historic properties. The cultural analysis uses file and literature sources, oral histories and field investigations to determine the nature and extent of such resources within the area of potential effect.

Other laws and regulations govern federal actions within the affected environment for cultural resources such as the Native American Graves Protection and Repatriation Act of 1990, as amended, the Archaeological Resources Protection Act of 1979, as amended, Executive Order 13007 regarding the protection of sacred sites, as well as other federal and Tribal laws, policies, regulations and guidelines.

The CTUIR maintain their cultural integrity through the gathering and use of natural materials. Cultural plants available to Tribal members include those used for food, ceremonies, fiber, and medicine. The demand for cultural plants is expected to increase due to population growth and increased interest in cultural heritage.

There are approximately 20,000 acres of Tribal fee and Indian trust forestlands within the exterior boundaries of the UIR including: 6,500 allotted trust acres, 9,900 Tribal trust acres and, 3,600 Tribal fee acres. These lands contain the entire spectrum of sensitive cultural resources significant to the CTUIR. From an archaeological standpoint, cultural resources include but are not limited to:

- Encampments
- Lithic Scatters
- Lithic Tool Quarrying Sites
- Rock Cairns
- Burials
- Petroglyphs
- Isolated Artifacts
- Village/Habitation Sites
- Historic Structures

Additionally, there are sites which may or may not have an archaeological component, but are nonetheless cultural resources. These sites include:

- Sacred Sites/Traditional Cultural Properties
- Vision Quest Sites
- Important Event Sites
- Traditional Gathering Areas
- Native Plants Habitats
- Hunting Areas
- Fishing Sites

From the CTUIR point of view, all of the natural resources upon which Tribal members depend are cultural resources, whether they are within the reservation, in the ceded lands or at usual and

accustomed fishing/hunting/gathering areas. In this respect, traditional archaeological practice differs from the Tribal perspective.

Many food and medicinal plants grow on the UIR. Some grow in forested areas, others along river and stream corridors, still others in grasslands. Many of these plants have multiple uses. The CTUIR have used most of them since time immemorial. Tribal elders report that some human activities such as timber harvest and livestock grazing have damaged some of the areas where these plants grow.

The two most culturally important plants found on forests of the UIR are big huckleberry (wiwnu) (*Vaccinium membranaceum*) and yampah (sawitk) (*Perideridia gairdneri*). Big huckleberry is well represented throughout all seral stages of the grand fir/big huckleberry plant association. Big huckleberry possesses an extensive system of rhizomes. Fruit productivity is more sensitive to solar radiation than vegetative production. Big huckleberry can grow beneath a partially closed forest canopy or in sunny openings but will decline in abundance as the forest canopy closes. Yampah grows in dry or wet meadows and along fringes of forest stands. Cous (xaws) (*Lomatium cous*) and bitterroot (pyaxi) (*Lewisia rediviva*) grow adjacent to forest stands and are extremely significant to the culture of the CTUIR.

Transportation System

The UIR has a large number of roads. Many roads in the range and forest area of the UIR were established as a result of historic use by Tribal members and other individuals. Surfaces are unimproved with inadequate drainage to prevent soil loss. Deep ruts are common during wet conditions allowing use only by vehicles with high clearance. These low standard roads provide operational access for land management plus Tribal member access for subsistence and recreational uses.

Many roads follow topographic features such as ridges and streams. Only a few roads were developed to standards in existence at the time they were constructed. During the past 60 years, the BIA and CTUIR have rarely performed maintenance on these roads due to lack of funds. Several roads constructed for timber harvest activities and located in riparian areas along major streams (Isqúulktpe, Buckaroo, Little Johnson, Big Johnson, and McKay Creeks) are no longer usable. It is likely that due to environmental concerns and costs, reconstruction of many of these roads will not be feasible. Reconstruction of these roads, if necessary, should be to the minimally necessary standard, using low impact and cost effective techniques.

Roads can account for a large percentage of human induced soil erosion. Extremely large amounts of sediment can enter streams from mass wasting of road fill material, concentration of surface runoff due to improper alignment and/or grade, concentration of surface runoff in ruts created by vehicle use, and destabilization of streambanks due to improper location of the roads.

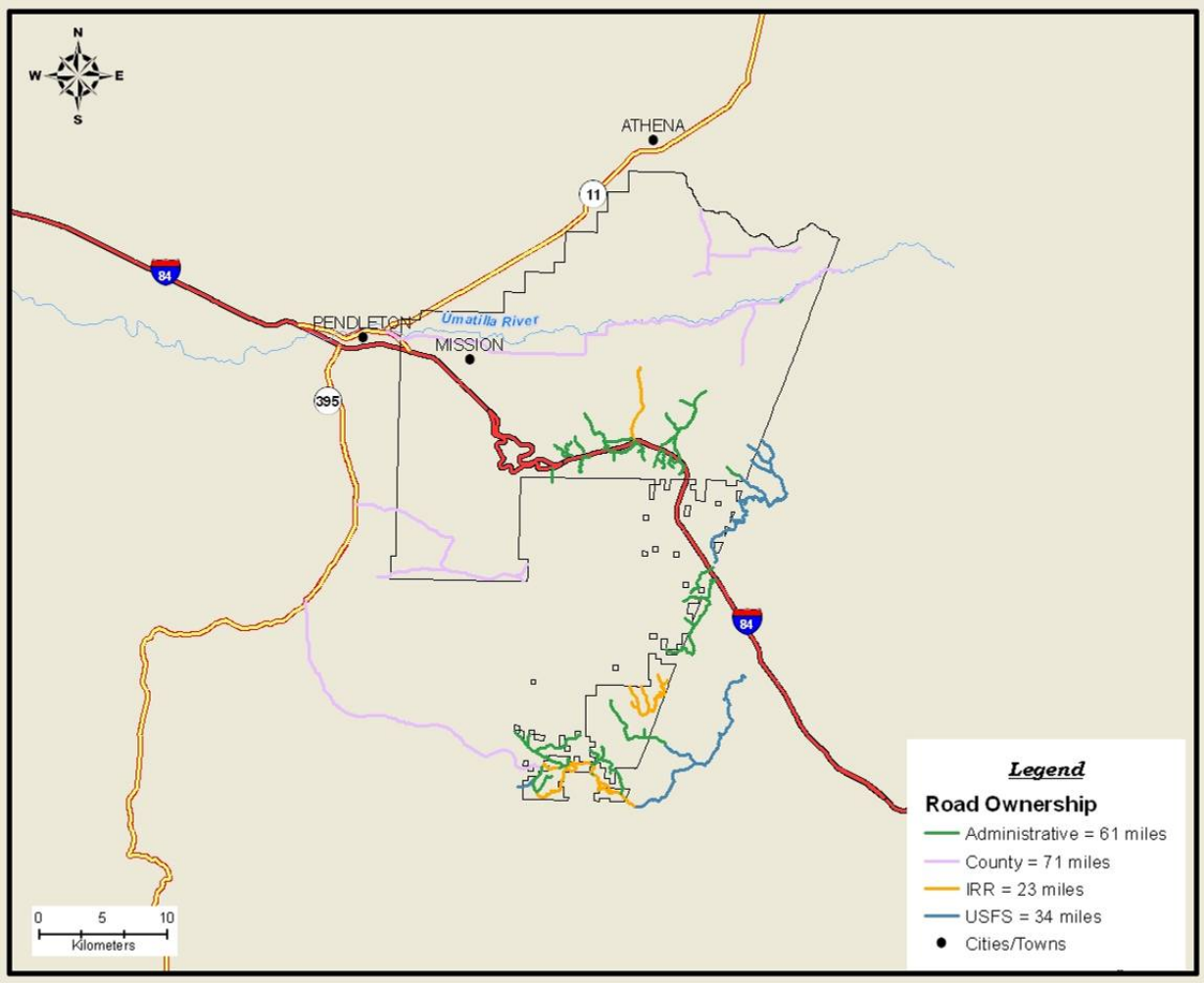
The BIA and CTUIR only consider approximately 189 miles of roads currently adequate, with minor maintenance, to serve as haul routes for timber harvest (Figure 2-7). Restricting timber harvest during the next 10 years to forest lands within one-quarter mile of those roads will give

the BIA and CTUIR ample time to plan a transportation system that serves the needs of the Forest Management Plan yet incorporates other natural resource and cultural values.

Air Quality

The Environmental Protection Agency has regulatory authority over air quality on the UIR. Regulations and standards of the Clean Air Act are applicable to sources of air emissions on the UIR. Air emissions are generally classified into: (1) area sources, (2) point sources, or (3) mobile sources. Identified area sources include fugitive dust, stationary sources too small or numerous to account for individually, residential wood burning, and forest and agricultural prescribed fires. Point sources are those that can be identified from a specific fixed point in space while mobile sources are tailpipe emissions from automobiles. Point sources on the UIR include the Mission Grain Elevator, Arrowhead Truck Plaza, Wildhorse Resort and Casino, and the Tribal Environmental Recovery Facility.

Figure 2-7. Current Road System On Forested Areas Of The Umatilla Indian Reservation.



Although lacking in information on emissions from some known point sources and agricultural practices, the Confederated Tribes (2006) developed a rough and incomplete estimate of air emissions on the UIR from data updated in 2000 (Table 2-16).

The UIR is in a Class II Area in attainment with the National Air Ambient Quality Standards. There are no major point sources of air emissions regulated under Title III, Title IV, or Title V of the Clean Air Act.

Table 2-16. 2000 Air Emissions On The Umatilla Indian Reservation (Tons/Year).

Source	Total Particulate Matter(PM10 and PM2.5)	NH3	NOx	CO	HC	VOC	SOx
Field Burning	166	56	98	2830	-	229	20
Residential Woodstoves	9	-	1	65	-	15	<1
Pioneer Asphalt	24	-	39	99	-	39	39
Grain Elevator	5	-	-	-	-	-	-
Mobile Sources	56	-	1238	2203	309	-	-
Fugitive Dust	24,088	-	-	-	-	-	-
Railroad	50	-	2004	523	-	71	326
Fertilizer & Pesticide Applications		33	-	-	-	-	-
Total Estimated Emissions Tons/Year	24,398	89	3380	5720	309	354	385

Socio-Economic Factors

For purposes of this document, the market for CTUIR timber is defined as Baker, Grant, Morrow, Umatilla, Union, Wallowa and Wheeler Counties in northeastern Oregon and Asotin, Columbia, Garfield and Walla Walla Counties in southeastern Washington. These counties contain the mills that one could reasonably expect to purchase CTUIR timber during normal market periods and the timberland supplying those mills.

The city of Pendleton is the recognized center of the forest products industry in Umatilla County. Easy access to rail transportation and the Columbia River facilitates exporting of finished lumber, logs and wood chips. The market area boundaries are dynamic, changing with the market. When log prices are high, logs can economically be hauled a longer distance. Conversely, when markets soften, economically feasible haul distances shrink.

The CTUIR market area includes five operating sawmills and one veneer mill. Many mills in this market area have closed during the last decade due to substantial reductions in timber supply. Many of the surviving mills, however, have increased capacity through mill improvements. Although the productive capacity of UIR forest lands is not high, it has the capacity to provide a continuous and positive cash flow which could support maintenance and enhancement of a broad array of other natural resources found on UIR lands, such as fisheries, wildlife and recreation.

[This page left intentionally blank]

Chapter III - Forest Management Direction

Introduction

After careful review of the issues and concerns and the options available for management for forests of the UIR, the BIA and CTUIR selected forest management direction based on the following criteria:

1. The management strategy must comply with provisions of the Comprehensive Plan, Columbia Basin Salmon Policy, Water Code, Total Maximum Daily Load, and Water Quality Management Plan.

2. The management strategy must balance the cultural, social, economic, and environmental values of the CTUIR.

3. The management strategy must promote forest health and sustainable forest ecosystems.

4. The management strategy must protect threatened or endangered species (summer steelhead and bull trout) habitat and protect important deer and elk security habitat.

5. The management strategy must provide a reasonable opportunity to achieve the goals and objectives identified during the planning process.

6. The management strategy must preserve options for change in management activities if monitoring reveals that the goals and objectives are not being achieved.

A management strategy that promotes the establishment and maintenance of healthy sustainable forest communities must be developed and implemented. Upland meadows, interspersed grasslands, and forest vegetation will be managed for traditional (i.e., Treaty-Reserved) resources (water quality, fish and wildlife habitat, cultural plants) as well as for the production of timber. Riparian areas and wetlands will be managed for production of fish and plant resources.

Grasslands, forests, and their associated riparian areas, springs, seeps, bogs, and meadows must be managed to be fully occupied by native plant communities that have the following characteristics:

- Structural and functional properties of dynamic, multi-aged communities should promote stability, provide resiliency to disturbance, and support overall diversity. Optimally, all age class of native vegetation should be represented.

- All plant communities should have a high capacity for capturing and retaining water and an inherent ability to provide for long-term stability of critical base stream flows.
- Riparian areas and wetlands should also act as sites for storage of organic material and sediment, making this material available to the channel for maintenance of its characteristic high quality fish habitat through time.

Monitoring is a critical part of the adaptive management cycle. The process of restoring and maintaining ecosystem function is implemented through management actions on a site-specific basis. Whether or not management actions are achieving the stated goals and objectives and the landscape is moving toward a desired future condition will be determined by the monitoring of individual plant communities. The results of these monitoring efforts would then be evaluated at the landscape scale to determine the overall health of the area. The conclusions would also be used to make recommendations on whether or not to continue current management or what changes may be needed in management practices to meet goals and objectives. The results could be changes in amount of vegetation treatment or a mix of these factors. Annual monitoring, including completion of compliance inspections, will be critical for the recovery of degraded riparian and upland sites.

Overall Management Intent

Background

The CTUIR and BIA intend to manage forest lands in an integrated manner. Terrestrial habitats and aquatic habitats and their associated species are intertwined through spatial overlap, energy flow, the hydrologic cycle, and nutrient cycling. Where ecosystems are in good condition, management direction requires they remain in good condition. Where the condition of the ecosystems is not good, management must occur that leads to improvement in ecosystem integrity and resiliency. The intent of management for habitats used by threatened and endangered species is to protect and/or improve those habitats contributing to recovery of the species. Management must also be implemented in the context of the subsistence and cultural needs of the CTUIR.

Goals and Objectives

Goal: Provide sustainable and predictable outputs and services including, but not limited to, high quality water, fish and wildlife habitat, native plant communities, and timber.

Goal: Sustain traditional, subsistence, and other cultural needs of the Confederated Tribes.

Goal: Provide consistent direction for management of forest resources.

Objective: Identify desired conditions of vegetation structure, composition, and distribution; hydrologic process and functions; and aquatic habitat structure and diversity.

Objective: Provide for the uses and values of the Confederated Tribes regarding natural resources consistent with maintaining healthy, diverse ecosystems.

Objective: Emphasize adaptive management.

Water Quality and In-Stream Fisheries Habitat Characteristics Component

Background

Human activities have significantly affected streams on the UIR. The Oregon Department of Environmental Quality (ODEQ) and the CTUIR list several streams on the UIR as water quality limited under Section 303(d) of the Clean Water Act of 1973, as amended, due to elevated water temperatures, increased rates of sedimentation, and/or modifications to stream habitat. The ODEQ has developed and approved a Total Maximum Daily Load (TMDL) and Water Quality Management Plan (WQMP) for several streams that originate in, or flow across, the UIR with associated implementation plans to improve water quality to a level that supports existing and designated beneficial uses (ODEQ 2001). However, the CTUIR exercises Environmental Protection Agency delegated authorities under Sections 303(c) and 401 of the Clean Water Act of 1973. The ODEQ TMDL and WQMP are applicable throughout the Umatilla Basin except for those areas within the diminished boundary of the UIR. The CTUIR has developed and approved a TMDL and WQMP for temperature and turbidity on the UIR (CTUIR 2005, CTUIR 2008).

The removal of riparian shrubs and trees through timber harvest and especially livestock grazing has reduced shading of streams leading to more direct exposure to direct sunlight, elevating water temperatures. Loss of riparian vegetation and establishment and/or construction of roads accompanying human activities such as timber harvest, livestock grazing, and subsistence or recreational use have also led to decreases in pool habitat, especially on lower gradient biologically productive areas. The abundance of in-stream wood is likely an important factor in controlling pool frequency. Wood also effectively stabilizes channels, influences sediment routing, provides a major source of in-stream organic matter, provides cover for fish and habitat for invertebrates, and increases overall channel complexity. The amount of fine sediment (sediment less than 0.25 in) is an important aspect of habitat quality that is influenced by management. Road density significantly affects surface fines and corroborates the link between forest management practices and channel sediment characteristics.

Goals and Objectives

Goal: Maintain or restore the chemical, physical, and biological conditions, as well as the cultural integrity, of surface waters.

Goal: Protect and restore watersheds, riparian zones, and wetlands to improve stream flow required to meet in-stream flow needs.

Objective: Moderate both summer and winter stream temperatures throughout all watersheds.

Objective: Manage riparian areas for multi-age plant communities that promote bank and channel stability, provide resiliency to disturbance, and generate aquatic diversity.

Objective: Manage for channel and substrate conditions that will not limit spawning and rearing of native fish.

Objective: Provide for natural channel forming and maintenance processes that will continue to operate without substantial long-term modifications.

Standards

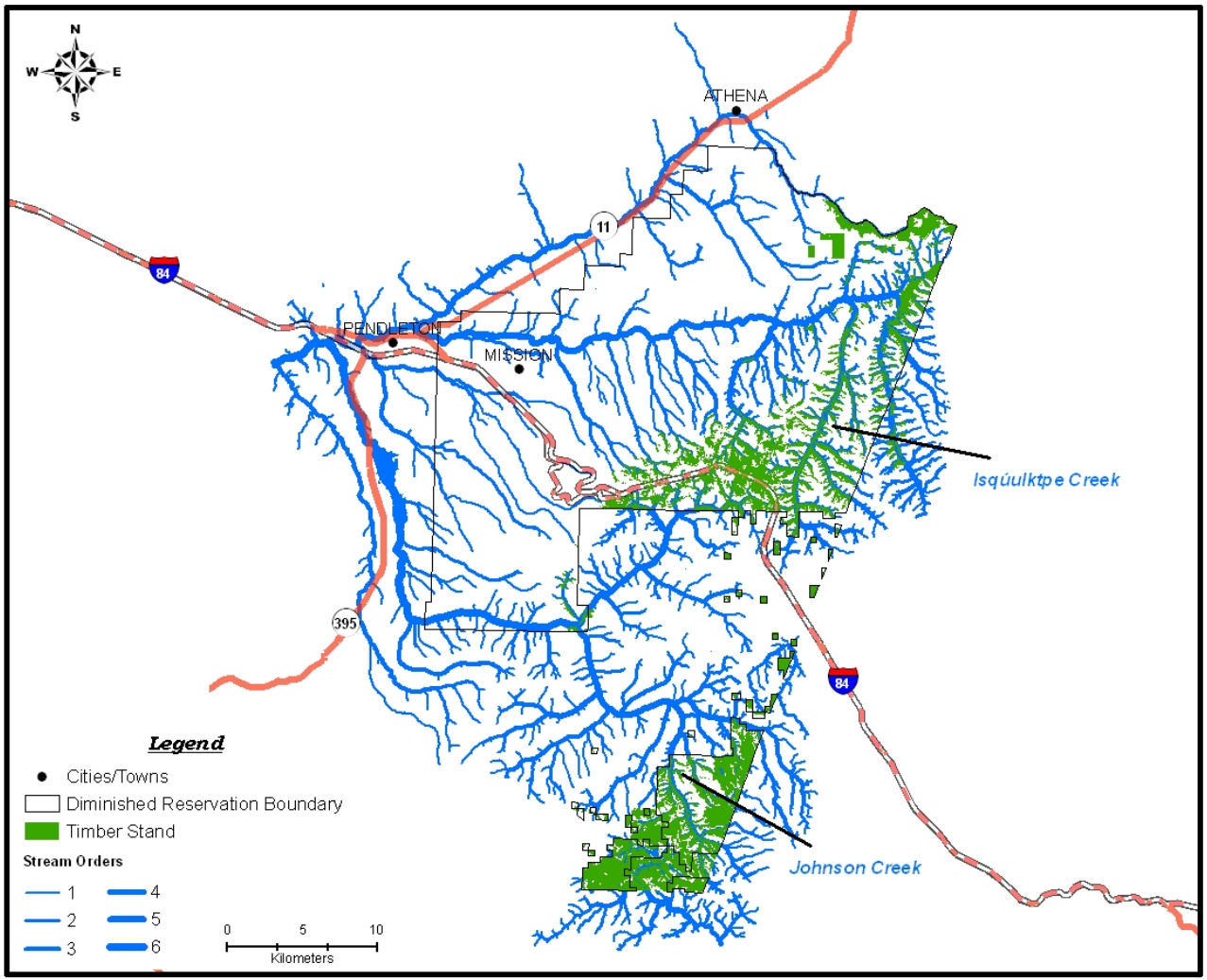
S1. **Standard.** Forest management practices will be planned and implemented to meet Tribal Water Quality Standards. In stream reaches where water quality does not meet Tribal Standards, forest management activities, including restoration measures, will be implemented to promote measurable improvement in water quality to meet the standards. Select water quality standards that have a high potential to be negatively impacted by forest management activities are described below.

- The highest seven day moving average of daily maximum stream temperatures shall not exceed 50 degrees F in bull trout habitat, 55 degrees F in salmonid spawning habitat, and 64 degrees F in salmonid rearing habitat.
- Bank stability on all streams shall average 80 percent or greater.
- Fine sediments (diam. <0.25in.) shall cover 20 percent or less of the stream channel.

S2. **Standard.** Riparian Management Zones (RMZ) shall be established that are equal to 75 feet horizontal width times the stream order (modified Strahler) plus the floodplain on each side of all streams (Figure 3-1) (Strahler 1964). The RMZ shall be 300 feet on each side of all fish bearing and perennial streams. The floodplain is defined as the valley floor from toe slope to toe slope.

- Commercial timber harvest within the floodplain is prohibited.
- For that portion of the RMZ outside the floodplain, in the inner 50 percent of RMZ horizontal width, timber harvest is allowed but in dry biophysical environments 80-120 square feet of basal area per acre must be retained while in moist biophysical environments 140-180 square feet of basal area must be maintained. The intent is to maintain potential shade for the site, wood recruitment to the floodplain and stream channels, and high quality cover for wildlife. Equipment operation is prohibited within this portion of the RMZ.

Figure 3-1. Riparian Management Zones On The Umatilla Indian Reservation.



- For that portion of the RMZ outside the floodplain, in the outer 50 percent of RMZ horizontal width, timber harvest must follow the standard basal area retention for the appropriate non-RMZ forest stand. Limited equipment operation is allowed within this portion of the RMZ.

S3. **Standard.** The structural and functional properties of riparian plant communities should promote floodplain, bank, and channel stability, provide resiliency to disturbance, and generate aquatic diversity. All age classes of naturally occurring vegetation should comprise these riparian plant communities. Ground cover should be at least 90 percent of that normally associated with each given site.

Forest Composition/Timber Production Component

Background

The forest stands of the UIR are primarily of natural origin. Site productivity varies greatly as does stocking and species composition. These forest stands fall into three broad groups: (1) dry upland forest group, (2) moist upland forest group, and (3) the cold upland forest group. The dry forest group occurs predominately at the mid and lower elevations and on southerly aspects in the forested zone. Dry forest types are generally limited by low water availability and are often subject to drought. This group primarily consists of ponderosa pine communities but Douglas-fir communities are also common at the upper elevations and moister sites. The moist forest group occurs primarily at mid to upper elevations on all aspects. This group primarily consists of grand fir and mixed conifer cover types. Mixed conifer types can include a variety of species including grand fir, Engelmann spruce, lodgepole pine, Douglas-fir, western larch, and ponderosa pine. The cold forest group occurs at upper elevations. The cold forest group is generally limited by a short growing season and on some sites low available moisture. Rates of tree growth are relatively slow. This group consists of grand fir and lodgepole pine communities (Quigley and Arbelbide 1997).

Timber harvest and fire suppression have reduced the prevalence of the dry forest group and increased the prevalence of shade-tolerant species within the dry forest group. The UIR has a long history of timber harvest. Since ponderosa pine is a valuable timber species, large mature stands were among the first to be harvested. Fire suppression further reduced the extent of ponderosa pine. The thick bark of ponderosa pine allows it to withstand ground fires better than the thin-barked true firs**.** In areas with a short fire return interval, firs never had an opportunity to become established**.** Fire suppression allows the shade-tolerant fir species time to establish in the understory of ponderosa pine forests. In the continued absence of fire, these species eventually become dominant when the canopy becomes dense enough that the shade-intolerant ponderosa pine seedlings cannot survive (Johnson et al. 1994).

The aerial extent of mixed conifer forests in the Blue Mountains has increased since European settlement, primarily due to their establishment in areas dominated by seral ponderosa pine under

natural fire return intervals (Quigley and Arbelbide 1997). Fire suppression has resulted in dense multi-storied forests of uniform age. In addition, harvest of grand fir and Engelmann spruce was negligible due to their relatively low value during early timber sales. These stands exhibit a higher degree of susceptibility to forest insects and disease (Johnson et al. 1994).

The cold forest group appears highly susceptible to tree mortality from fires, insects, diseases, and stress. In the Blue Mountains, shade intolerant species historically dominated early to mid seral physiognomic types while shade tolerant species dominated the late seral physiognomic type. Lethal crown-fires of high intensity are now more common due to past fire suppression and increases fuel loads (Quigley and Arbelbide 1997).

Prior to 1970, the demand for fuel wood was primarily limited to local Tribal members who had traditionally burned wood for home heating and ceremonial or subsistence use. The energy crisis coupled with the rapid expansion of housing on the UIR substantially increased the demand for fuel wood. Tribal members may gather fuel wood, post and poles, and Christmas trees on Tribal lands under a free use permit. In addition, individual landowners may gather fuel wood on their property. Coupled with the rising demand for fuel wood was the growing supply of readily available dead lodgepole pine and Douglas-fir as the result of insect outbreaks.

As the supply of fuel wood along existing roads diminished, Tribal members established new roads to reach additional supplies of fuel wood. Tribal members have now gathered fuel wood on most of the relatively flat accessible areas of the UIR. If tree mortality does not increase due to new disease or insect outbreaks, the supply of fuel wood may decrease in the future if forest stands are subject to timber harvest for forest health and/or economic reasons.

Goals and Objectives

Goal: Preserve future management options by maintaining and promoting healthy, productive, and diverse forest plant communities as appropriate to climate, soil type, and landform.

Goal: Manage vegetation structure, stand density, species composition, and patch size and pattern to reduce the occurrence of uncharacteristically large and high severity wildfires.

Goal: Manage vegetation structure, stand density, species composition, and patch size and pattern to reduce excessive levels of mortality from insects and diseases including, but not limited to, bark beetles, western spruce budworm, Douglas-fir tussock moth, trunk and heart rots, dwarf mistletoe, and various root pathogens.

Goal: Manage the forest to maintain or enhance the long-term productivity of the timber resources.

Goal: Facilitate the harvest of timber at a rate that is sustainable, consistent with multi-resource objectives.

Goal: Provide Tribal members the opportunity to gather personal use products such as fuel wood, posts, poles, and Christmas trees while maintaining adequate forest residue to meet other resource objectives and biological needs of the site.

Objective: Prevent and control large-scale damage to forest resources by insects, disease, and wildfire through appropriate silvicultural prescriptions.

Objective: Identify appropriate species composition, age class differences, and stand structure for each plant association/timber management group.

Objective: Maintain individual tree and stand vigor through proper species selection and stocking control to minimize timber losses as measured by reduced growth, amount of defect, and mortality.

Objective: Provide for both natural and artificial regeneration methods. Utilize local seed sources where artificial methods are used. Leave superior seed trees for natural regeneration.

Objective: Identify and inventory sensitive and/or unique areas that will be managed through passive rather than active management.

Objective: Manage stands that occur within the different plant associations/timber management groups to maintain or improve growth. Establish appropriate rotation lengths and entry cycles.

Objective: Prioritize the salvage of dead and dying trees within the harvestable forest base.

Objective: Decrease the area dedicated to roads and landings.

Objective: Return income to landowners from prescribed silvicultural treatments.

Objective: Provide, on an annual basis, areas that are easily accessible and open for wood gathering.

Objective: Utilize logging and thinning slash to meet small wood requirements. Allow adequate time for product removal prior to any site treatment that reduces the amount of slash.

Objective: Identify areas of high fuel loadings and/or dead wood concentrations suitable for personal use products.

Standards

Forest Composition

S4. Standard. The areal extent of forest community types will be maintained at approximately the historic level.

S5. Standard. Structural stages of forest community types will be maintained within the Historic Range of Variability (Table 3-1).

Table 3-1. Historic Range Of Variability In Forest Structural Stages.

Biophysical Environment	**Structural Stage**			
Plant Association Groups (PAG)	Stand Initiation	Stem Exclusion	Understory Re-initiation	Old Growth
Hot Dry Ponderosa Pine/Bluebunch Wheatgrass Ponderosa Pine/Idaho Fescue	5-15%	5-30%	5-25%	5-70%
Warm Dry Ponderosa Pine/Common Snowberry Douglas-fir/Elk Sedge Douglas-fir/Pinegrass Douglas-fir/Common Snowberry Douglas-fir/Mallow Ninebark Grand Fir/Pinegrass	5-15%	5-30%	5-25%	5-70%
Warm Moist Douglas-fir/Creambush Oceanspray	0-30%	0-55%	5-55%	0-30%
Cool Moist Grand Fir/Northern Twinflower Grand Fir/Big Huckleberry	1-15%	1-25%	5-25%	10-60%
Cold Dry Grand Fir/Grouse Whortleberry	1-30%	5-35%	5-30%	1-60%
Cool Dry Lodgepole Pine/Pinegrass	5-15%	10-40%	5-30%	5-70%

S6. **Standard.** High stand vigor will be maintained through stocking control in order to provide for stand resistance to diseases and insects. "Suggested Stocking Levels for Forest Stands in Northeastern Oregon and Southeastern Washington: An Implementation Guide for the Umatilla National Forest" (Powell, 1999) will be used to help develop target stocking levels for stands by plant association.

Timber Production

S7. **Standard.** Timber management activities will be applied as a tool to meet multiple resource management objectives. These activities include:

1. Site preparation.
2. Tree improvement including selection of superior seed trees and planting genetic stock.
3. Reforestation by planting, seeding, or natural means.
4. Pre-commercial thinning.
5. Commercial thinning.
6. Sanitation harvest.
7. Salvage harvest.
8. Prescribed fire.

S8. **Standard.** Silvicultural prescriptions will be prepared for all activities proposing management of forest vegetation to meet resource objectives and should:

1. Consider stand conditions and structure.
2. Consider the silvics of the tree species.
3. Permit the production of a volume of marketable trees sufficient to use all trees that meet utilization standards and are designated for harvest.
4. Permit the use of acceptable logging systems that can remove logs and other forest products without excessive damage to the identified desirable retained vegetation.
5. Achieve multiple management objectives and provide for special management conditions.
6. Use appropriate practices to establish desired species, composition, density, and rates of growth of trees and other vegetation needed to achieve objectives.
7. Promote stand structures and species composition that minimizes serious risk of damage by insects, disease, or wildfire.
8. Assure that lands can be adequately restocked within acceptable timeframes.

S9. **Standard.** Silvicultural prescriptions must address the following:

1. Designation of number and sizes of snags, green wildlife trees, and downed logs that meet the habitat requirements for cavity dependent species.
2. Protection, maintenance, and enhancement of hardwood vegetation.
3. An optimum and minimum stocking level where regeneration harvests are applied.
4. Integrated pest management should be addressed in both the long and short-term.
5. The use of prescribed fire as a silvicultural tool in support of returning fire to its natural role in the ecosystem.

S10. **Standard.** Stand exams and/or data gathering processes will be used to verify or develop silvicultural prescriptions. Data gathering processes will be designed to provide the appropriate detail and accuracy commensurate with the complexity of the silvicultural and resource decisions at hand.

S11. **Standard.** Harvest will be achieved primarily through use of uneven-aged practices of individual tree and group selection. Even-aged management practices such as shelterwood and seed tree harvests will be used only where necessary to meet management objectives.

1. Individual tree selection should be applied where forest stands contain a variety of size classes, usually three or more, which are evenly distributed on nearly every acre throughout the stand and contain preferred species without significant disease problems.

2. Group selection should be applied where forest stands contain a mosaic of small even-aged patches, where control over species is important, or where significant disease problems are present. Even-aged groups may be as small as one-quarter acre or as large as 5 acres. The application of group selection will be objective oriented and will depend on the number of age classes desired, the percent of land desired in each class, and desired intervals between harvest entries.

S12. Standard. Salvage harvest will be used to recover economic values of timber killed by events such as wildfire, windstorms, and insects and disease but must be consistent with multi-resource management objectives.

Fire Management Component

Background

The changes in vegetation composition and structure of forests that have occurred since establishment of the UIR have increased the risks associated with wildfires. Wildfire suppression activities have been successful in reducing the extent of wildfires, thus influencing vegetation succession. Fuel loadings have steadily increased as a result of suppression efforts and the subsequent decline of fire frequencies, especially in the dry forest group. The creation of ladder fuels in the shrub/tree communities can permit low intensity ground fires to access tree crowns increasing the chances for higher heat intensities and spread rates that limit control capabilities and generally result in larger areas burned. As a result, the potential for severe fire intensity has increased along with suppression costs and associated hazards to life and property.

The extent of the wildland urban interface has also increased within the last few decades. These areas of growing human population are commonly associated with high fire risks. There are many residences throughout the UIR that could be at risk from wildland fire. Some of the owners have taken measures to reduce the risk of a wildfire destroying their buildings but others have not. There is a need to educate homeowners about the risk they face from wildfires and the measures they can take to reduce such risk.

Goals and Objectives

Goal: Develop and maintain a fuels management and prescribed fire program that effectively reduces the hazard of accumulated fuels and achieves multiple resource objectives.

Goal: Provide for the natural role of fire in maintaining a viable and healthy ecosystem.

Objective: Treat areas of high fuel levels resulting from insect, disease, wind, or other heavy biomass accumulation.

Objective: Use prescribed fire to encourage regeneration of more seral species.

Objective: Use prescribed fire to enhance productivity and reduce potential damage to existing resources.

Objective: Reduce or eliminate incidence of human caused wildfire.

Standards

S13. Standard. Utilize Appropriate Management Response (AMR) on all wildland fires.

S14. Standard. Identify areas where use of prescribed fire can help to meet vegetation management objectives.

Wildlife/Wildlife Habitat Component

Background

The UIR provides year round habitat for Rocky Mountain elk (*Cervus elaphus*), mule deer (*Odocoileus hemionus*), and white-tailed deer (*Odocoileus virginianus*), with the greatest densities occurring during the winter and early spring. However, there have been substantial annual differences in numbers of these ungulates utilizing UIR habitats depending on winter severity and overall population sizes. During severe winters in the 1980's, elk numbers exceeded 6,000 within the original boundary of the UIR. In addition, at least 3,000 mule deer and several hundred white-tailed deer also utilized the range and forest lands of the reservation. During the moderate winters of the late 1990's and early 2000's elk numbers did not exceed 2,000 within the original boundary of the UIR while mule deer numbers did not exceed 1,500. In addition, elk herds also experienced a decline in productivity during the same period resulting in lower population sizes. The number of elk and mule deer that are year round residents on the UIR is unknown. White-tailed deer numbers on the UIR are currently estimated to be in excess of 1,500 with the majority being year round residents (Scheeler pers. comm.). All these species are essential to support Tribal subsistence hunting needs.

Deer and elk use of forested habitats can be predicted from the size and spacing of cover and forage areas. Use of cover is disproportionately greater in cover areas within 200 yards of cover-forage edges and of forage areas within 300 yards of such edges (Thomas 1979). The observed preference of deer and elk for specific kinds of cover may or may not be an expression of need. However, biologists consider it prudent to assume that preferred kinds of cover provide an advantage to these ungulates over non-preferred or less-preferred options.

Changes in forest habitat components have reduced habitat availability and quality for wildlife species dependent on timbered uplands. In natural landscapes, stochastic events produce more complex landscapes than those found in managed forests. Variations in susceptibility to disturbance, weather patterns, and soil moisture result in forest patches of a variety of shapes,

sizes, and stand age classes (McKelvey et al. 2000). This heterogeneity has been reduced through timber harvest and fire suppression. Dense stands of mid-seral Douglas-fir and grand fir have increased in prominence while old growth forests and species like ponderosa pine and aspen (*Populus tremuloides*) have declined.

The prominence of snags and downed wood is a particularly important element of forest diversity that has been reduced. In the Blue Mountains of Oregon and Washington, nearly 100 different wildlife species of birds and mammals use dead and downed trees as sites for nesting, feeding, and perching. Nearly 60 species depend on suitable wildlife trees and associated cavities for their survival. Primary excavators such as the pileated woodpecker create holes in dead and dying trees that may be used later by secondary cavity users such as owls, bluebirds, wrens, and squirrels (U. S. Forest Service 1990). Declines in mature forest habitat have likely contributed to population declines in many species including the Vaux's swift (*Chaetura vauxi*), which nests in large hollow trees, and the northern goshawk (*Accipiter gentilis*), which requires large trees to support its sizeable nest (Csuti et al. 1997).

Dead and down wood is more abundant in true fir and mixed conifer stands across the subbasin, but less abundant in fire-regulated pine communities. Large-diameter trees will remain longer on the landscape than small-diameter trees. Dead wood densities will fluctuate across the landscape as a result of natural mortality. Snag and down wood abundance is subject to the frequency and intensity of large and small-scale disturbances such as fires, insects, disease, ice storms, and drought that have historically occurred throughout the area (Quigley and Arbelbide 1997).

Goals and Objectives

Goal: Maintain high quality big game summer, transitional, and winter range habitat conditions including high quality cover, forage, water resources (springs, seeps, and riverine), and security habitats to provide viable, harvestable, and sustainable big game populations.

Goal: Provide high quality habitat conditions to support viable and sustainable populations of wildlife resources dependent on snag and log habitat.

Goal: Ensure adequate distribution of well-connected persistent high quality habitat representing different forest community types and structural stages for other wildlife species.

Objective: Maintain the amount and arrangement of cover and forage areas to optimize use of the maximum possible area by big game.

Objective: Provide and maintain big game security habitat.

Objective: Provide and maintain sufficient snag levels to support desired population levels of primary and secondary excavators.

Objective: Represent a diverse range of forest successional stages.

Objective: Protect special and unique habitats such as geomorphic features.

Standards

Big Game Habitat

S15. Standard. Maintain optimum big game summer, transitional, and winter range habitat conditions including high quality cover, forage, water resources (springs, seeps, and riverine), and security habitats to provide viable, harvestable, and sustainable big game populations.

1. Maintain greater than a 40:60 ratio of cover to forage habitats, on a subwatershed basis, in G-1 Big Game Winter Range, and F-1 and F-2 Big Game Summer and Transitional Ranges.

2. Maintain minimum tree stocking levels in all Potential Vegetation Groups (PVG) to maintain structural diversity, and thermal/hiding cover for big game and other wildlife resources. Minimum stocking standards are designed to maintain habitat diversity in the form of vertical and horizontal structural diversity and minimum levels of canopy closure to provide at least marginal thermal cover (e.g., 40-69% canopy closure).

   Attempt to maintain hiding cover (cover habitat with less than 200 foot sight distances) in the Moist Forest PVG by maintaining vegetative screens within managed timber stands. Hiding cover can be achieved by adjusting harvest prescriptions such that small, non-harvested patches remain within the stand, altering tree spacing, and protecting saplings.

3. Created openings (timbered stands containing less than 30 percent canopy closure in the Dry Forest PVG and 40 percent canopy closure in the Moist Forest PVG) shall not exceed 5 acres in size, with the exception of created openings within the lodgepole pine type. Openings up to 40 acres in size are allowed within this forest type.

   Created openings shall be separated by cover stands (marginal or satisfactory thermal cover) greater than 40 acres in size.

   When planning created openings in stringer timber environments and adjacent to natural openings, at least 80 percent of the created opening will be located within 600 feet of a thermal cover patch at least 40 acres in size.

   Consider a harvested area of commercial forest land a created opening until minimum stocking level is reached and seedling stock consists of live trees 10 feet or greater in height.

4. On big game winter range, a minimum of 10 percent of existing timbered stands within a given ownership should provide satisfactory thermal cover throughout the timber management rotation period.

5. Seed skid trails and landings with appropriate seed mix of native grasses and forbs and/or acceptable native cultivars.

6. Maintain less than 1.0 miles of open road per square mile to maintain big game habitat security and minimize harassment. Road density standards can be achieved by closing roads to motorized vehicles using physical barriers, gates, etc. On roads planned for closure, necessary maintenance should be performed to put the roads in a "self maintaining" state. Maintenance options can include drainage upkeep, pulling culverts, removing or lowering fills, and other means.

Snag and Log Habitat

S16. Standard. Provide optimum habitat conditions to support viable and sustainable populations of wildlife resources dependent on snag and log habitat.

1. Provide snag levels that are within the historic range of variability (Table 3-2).

Table 3-2. Blue Mountains Large Snag Standards For Various Potential Vegetation Groups And Historic Range Of Variability Categories (Adopted From ICBEMP Supplemental Draft EIS, Appendix 12)

Fire Regime	PVG	Large (21"+) Snags/Ac. HRV Mid	Large Snags/Ac. HRV – 30%	Large Snags/Ac. HRV +30%
High Intensity	Cold Forest	8.1	5.7	10.5
	Dry Forest	2.1	1.5	2.8
	Moist Forest	4.7	3.3	6.2
Low Intensity	Cold Forest	3.0	2.1	3.9
	Dry Forest	0.4	0.3	0.6
	Moist Forest	2.4	1.7	3.2

If 21 inch DBH snags are not available, leave the largest trees for snag retention 12 inches DBH or greater. Tree species of priority for snag habitat standards are ponderosa pine, western larch, grand fir, and Douglas-fir, but priority tree species does not override size requirements.

Snags and recruitment trees protected in RMZ buffers can be factored into snag retention requirements based on proportion of RMZ within a given stand. Snag retention requirements will be achieved on a 20 acre basis. If 10 acres of a 20 acre stand occurs within an RMZ buffer, 50 percent of the snag retention guidelines can be achieved in the RMZ.

Protection of snag clumps is preferable to protecting individual snags within a harvest unit boundary. Clumps should be located in the interior of the harvest unit rather than the edges and should be large enough to allow for adequate protection during logging operations. Generally, there would be 2-3 patches per harvest unit (every 20 acres), but in specific instances, smaller, but more frequent clumps or individual snags can be left to provide for site productivity and habitat needs.

2. Adequate numbers of green trees shall be retained in harvest units to ensure snag and log habitat can be achieved over time.

   Minimum stocking standards shall include at least 6 live trees per acre in the Dry Forest PVG and 12 trees per acre in the Moist PVG greater than 21 inches DBH, where available, for snag recruitment trees. The preferred tree species and size guidelines listed above apply for recruitment standards.

   To the extent practicable, all cull trees greater than 21 inches DBH shall be maintained standing and protected through all phases of forest management activities.

3. Maintain large down woody material per the table below for purposes of providing foraging substrate, site productivity, and micro-sites for micro-organisms (Tables 3-3a and 3-3b).

Table 3-3a. Blue Mountains Large Downed Wood Specifications For Various Potential Vegetation Groups (Adopted From ICBEMP Supplemental Draft EIS, Appendix 12)

PVG	Piece Length (feet)	Pieces Per Acre	Small End Diameter	Total Linear Length (feet)
Dry Forest	>6	3-6	12”	20-40
Moist Forest	>6	15-20	12”	100-140
Cold Forest	>8	15-20	8”	120-160

Table 3-3b. Blue Mountains Large Downed Wood Standards Per Acre By Fire Regime For Various Potential Vegetation Groups And Historic Range Of Variability Categories (Adopted From ICBEMP Supplemental Draft EIS, Appendix 12)

Fire Regime	PVG	LDW/Ac. HRV Mid	LDW/Ac. HRV – 30%	LDW/Ac. HRV +30%
High Intensity	Cold Forest	10.1	7.1	13.2
	Dry Forest	2.7	1.9	3.4
	Moist Forest	7.1	5.0	9.2
Low Intensity	Cold Forest	8.3	5.8	10.8
	Dry Forest	0.7	0.5	0.9
	Moist Forest	0.8	0.6	1.1

Old Growth Habitat

S17. Standard. Harvest of trees greater than 21 inches DBH shall be deferred to protect old growth habitat and late/old structural stages. Trees greater than 21 inches DBH may be harvested when necessary to maintain stocking control.

This interim protection measure will remain in place until completion of a reservation wide assessment of the status of old growth habitat and development of a management plan that addresses existing conditions, historic conditions, and conservation areas.

Special and Unique Habitat Features

S18. Standard. Avoid special and unique habitat features, where practicable. Buffers shall extend three potential tree heights extending from the special or unique habitat feature into the adjacent forest environment to protect micro-site characteristics and integrity of the feature.

S19. Standard. Protect raptor nesting structures (stick nests) during all phases of logging operations. A CTUIR Department of Natural Resources (DNR) Wildlife Biologist will be consulted to determine appropriate measures to protect active nest sites/structures. Protection efforts can include adjustments to harvest unit boundaries, operating seasons, and harvest scheduling.

General Provision

S20. Standard. Avoid logging operations, including road construction/reconstruction during the period December 1 through March 31 to minimize disturbance to wintering big game and March 31 through June 15 on key calving/fawning areas to minimize disturbance during spring reproductive periods. Site-specific modifications to this general provision can be made under appropriate conditions through consultation with a CTUIR DNR Wildlife Biologist.

Threatened and Endangered Species

Background

As part of the decision making process, federal agencies must consider the effects of their actions on listed, or proposed to be listed, threatened and endangered plant and animal species. The Endangered Species Act of 1973, as amended, requires federal agencies to insure that all actions are not likely to jeopardize the continued existence of any threatened or endangered species. The BIA is required to consult both informally and formally with NOAA-Fisheries or the U.S. Fish and Wildlife Service for those actions which may, or will, affect listed species prior to implementing the actions.

Based on a biological evaluation or assessment, the BIA may conduct an informal consultation with NOAA-Fisheries and/or the U.S. Fish and Wildlife Service if a proposed activity may affect a federally listed species. If such informal consultation with NOAA-Fisheries and/or the U.S. Fish and Wildlife Service results in a determination that the proposed activity is not likely to adversely affect the listed species or its habitat, no formal consultation is required.

Under Section 7 of the Endangered Species Act of 1973, the BIA must enter into formal consultation with NOAA-Fisheries and/or the U.S. Fish and Wildlife Service when it determines an action may or will adversely affect a listed species or its habitat. The formal consultation follows statutory and regulatory timeframes and procedures and results in a written biological opinion of whether the proposed action is likely to result in jeopardy to a listed species or adverse modification of designated critical habitat and an incidental take statement.

The BIA has not developed policy regarding the designation of sensitive plant and animal species. A sensitive species could be defined as those plant and animal species for which population viability is a concern as evidenced by: (1) significant current or predicted downward trends in population numbers or density or (2) significant current or predicted downward trends in habitat capability that would reduce a species existing distribution.

Goals and Objectives

Goal: Protect threatened and endangered species and their habitats.

Goal: Contribute to range-wide recovery of threatened and endangered species.

Objective: Insure that all actions consider impacts to threatened and endangered species.

Objective: Identify opportunities to improve habitat critical to threatened and endangered species.

Standards

S21. Standard. Legal and biological requirements for the conservation of endangered, threatened, and sensitive plants and animals will be met.

S22. Standard. The required biological assessment process will be carried out according to the requirements of the Endangered Species Act, as amended. Consultation requirements of the USDI Fish and Wildlife Service and the USDC NOAA-Fisheries will be met.

Cultural Resources and Traditional Uses Component

Background

To comply with Section 106 of the National Historic Preservation Act of 1966, as amended, all federally approved, funded or supervised undertakings must be evaluated for their effects upon historic properties. The cultural analysis uses file and literature sources, oral histories and field investigations to determine the nature and extent of such resources within the area of potential effect.

In 1996, the U.S. Department of the Interior, National Park Service, selected the CTUIR to assume historic preservation management review on the UIR under the 1992 amendments to the National Historic Preservation Act of 1966. Prior to any ground disturbing activities, the Cultural Resources Program, Department of Natural Resources, of the CTUIR must be consulted to determine what, if any, impacts will occur to historic properties. All known or discovered cultural and archeological resources will be addressed in the Section 106 process. In the event that previously unknown cultural resources are discovered during project activities, these activities must be suspended until the impacts to the historic properties can be addressed.

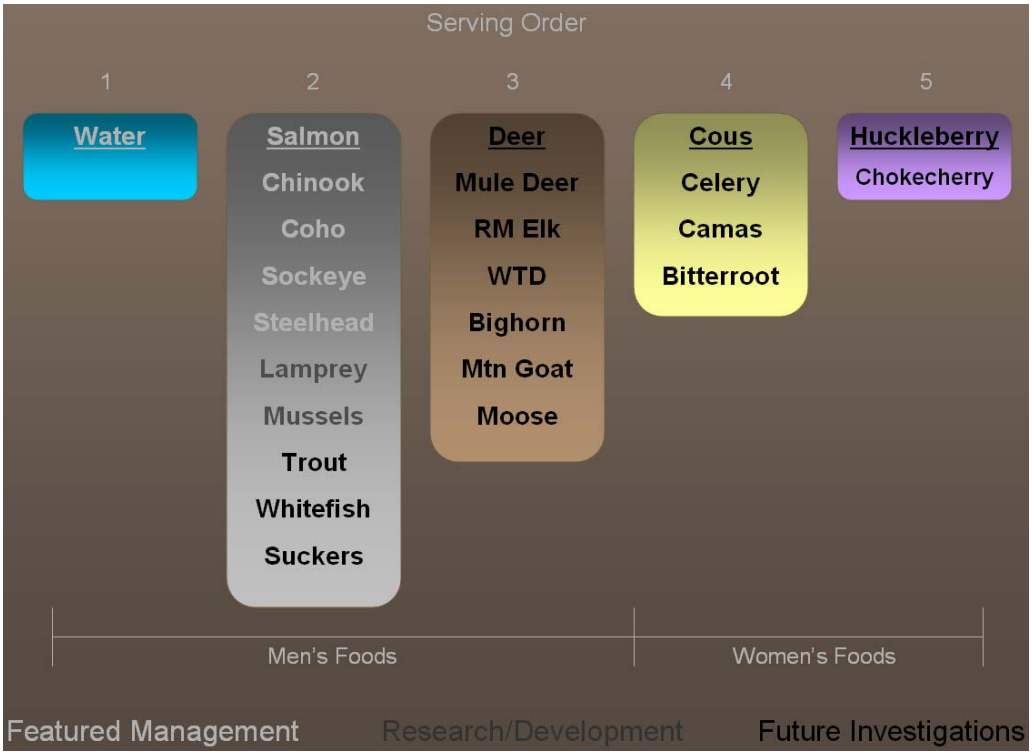
The value of *First Foods* to the CTUIR community is evidenced by the longevity and constancy of the foods and serving ritual across many generations and recognition through *First Food*-related ceremonies (Figure 3-2). While the means to pursue, acquire, process and prepare *First Foods* has changed dramatically with the advent of settlement by non-indigenous peoples, the order has not. Tribal members have adapted a variety of means to acquire *First Foods* over time yet *First Foods* and their serving order remain constant. Despite the availability of new, introduced foods, *First Foods* have not been replaced in the serving ritual (e.g. bass have not taken the place of salmon, nor wheat the place of cous in the serving order). New foods are served at Tribal meals, but they are not recognized in the serving ritual; they are served after *First Foods*, and with no formal order or sequence that relates to CTUIR cultural beliefs.

First Foods ceremonies are still recognized by people who harvest their first salmon, kill their first deer, dig their first roots, and pick their first berries. Further evidence of the order's durability is apparent at celebrations ("pow-wows") where some traditional dance categories may require individuals to have had their "First Kill Ceremony" for deer as a requisite to participation in the dance.

While based in tribal creation belief that these foods promised themselves to the tribes in this order, the serving order also elegantly incorporates spatial and phenological relationships that, when recognized, may be used to focus management efforts on ecological processes that produce and sustain *First Foods*, and the habitats that underlie them.

A careful review of the *First Foods* order, and a partial list of related foods, reveals that the *First Foods* order incorporates ecological and spatial factors into the food order. The salmon represents a grouping of aquatic life forms; the deer represents ungulates; cous represents below-

Figure 3-2. A Partial List Of *First Foods*.

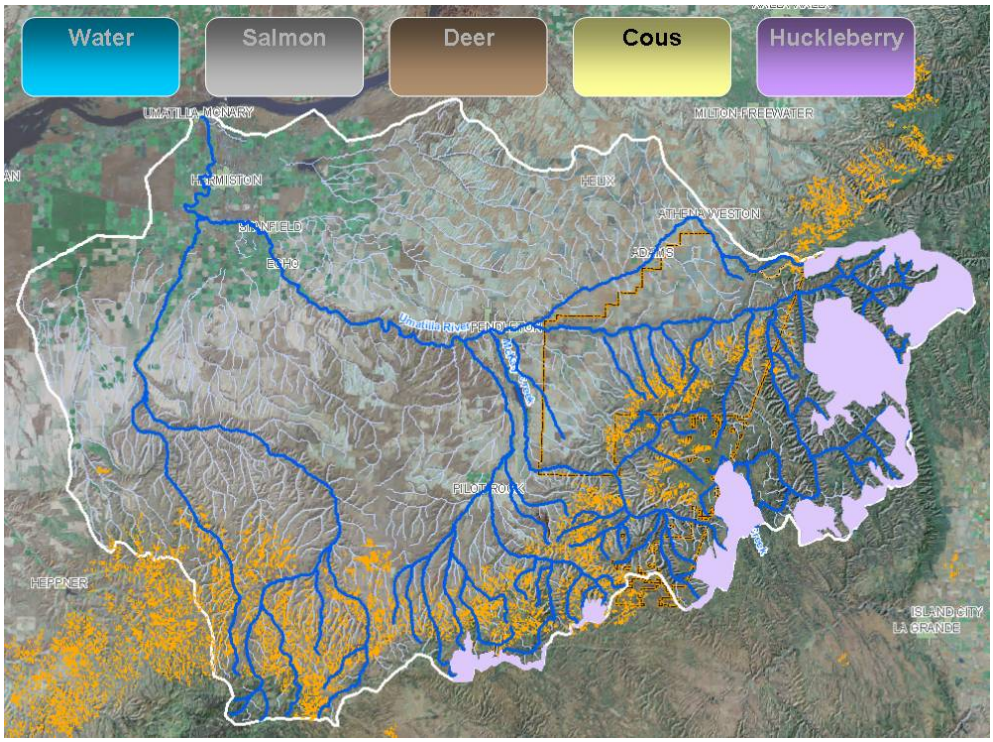


ground rooting plants; and huckleberry represents above ground fruiting plants. In a spatial context, the *First Food* order moves from water and in-stream habitats (aquatic organisms) to the low elevation foothills and rangelands (cous), and finally to higher elevation forests (huckleberry) (Figure 3-3). Therefore, their position on the landscape relates strongly to phenology and thus their timing of availability for harvest and recognition through associated feasts.

The distribution of the *First Foods* throughout the usual and accustomed areas creates relationships with private, state, and federal entities--particularly parties with explicit trust responsibilities to protect and sustain treaty-reserved resources. Each *First Food*, and the portion of the landscape which provides it, is protected by Treaty Rights negotiated in the CTUIR Treaty of 1855.

The *First Foods* are considered by the CTUIR DNR to constitute the *minimum* ecological products necessary to sustain CTUIR culture. Management efforts need to incorporate ecological processes (for example, fire regimes in upland range and forest lands and high stream flows in floodplains) that relate to the sustained production of *First Foods,* and begin the challenging process of formally investigating ecological relationships important to "Women's Foods".

Figure 3-3. Historical Distribution Of *First Foods* In The Umatilla Subbasin.



Goals and Objectives

Goal: Maintain the integrity of cultural resource sites.

Goal: Maintain and/or enhance traditional foods such as native roots, berry patches, and medicinal and/or fiber species.

Objective: Prevent damage of existing cultural resource sites by roads, timber harvest, and other activities that might disturb artifacts and features (fireplaces, rock cairns, corrals and other objects).

Objective: Prevent damage to and adverse changes to the setting of traditional cultural properties.

Objective: Protect, restore, and enhance the *First Foods* – water, salmon, deer, cous, and huckleberry – for perpetual Tribal cultural, economic, and sovereign benefits.

Standards

S23. Standard. Provide for the documentation, protection, and preservation of prehistoric and historic sites, buildings, objects, antiquities, and contemporary cultural use sites.

S24. Standard. Project level cultural resource inventories will be carried out.

S25. Standard. Design projects to avoid damage or disturbance to historic properties and develop appropriate avoidance measures or mitigation procedures in the event cultural sites are encountered.

S26. Standard. Cultural resource management will be coordinated with the Department of Natural Resources Cultural Resources Protection Program.

S27. Standard. Ethno-botanical or cultural plant maps will be prepared for use in management of cultural plants. These maps will be updated as additional information on the locations of edible, non-edible, and medicinal cultural plants becomes available. Monitoring of cultural plants will be at the project and forest wide level.

Transportation System Component

Background

A transportation system that allows for management of natural resources and cultural and subsistence use of the UIR by Tribal members is vital. The existing transportation system provides for forest and range management activities as well as access for gathering culturally important foods and fuel wood, subsistence hunting, recreation, and many other activities. Although some of the existing transportation system was constructed for timber harvest, much of the transportation system resulted from continual vehicle use. Quite a few of the existing roads are only suitable for high clearance vehicles and may be impassable during wet weather. Beginning late in 2009 or early in 2010, the Transportation Program within the Department of Public Works plans to identify and map all roads with the intent of developing a Travel and Access Management Plan that can be used as a guide for the long-term management of the road system.

Goals and Objectives

Goal: Provide access for forest, range and fire management activities as well as cultural and subsistence use by Tribal members.

Goal: Design, operate, and maintain a safe and economical transportation system, in a manner protective of resource values.

Objective: Identify the number and location of roads for management and access by Tribal members through the Travel and Access Management Plan and the Long-Term Transportation Plan.

Objective: Establish standards for different categories of both permanent and temporary roads.

Objective: Close roads not needed for resource management purposes or access by Tribal members.

Standards

S28. Standard. Road access will be adequate to accomplish commercial, resource, and protection management activities as well as subsistence use. Operate and maintain all roads according to management emphasis and maintenance levels appropriate to planned uses and activities, safety, economics, and impacts on land and resources.

S29. Standard. Road access may be restricted due to road structural limitations, safety considerations, road standards, or limitations imposed by resource management.

S30. Standard. For roads that are designated as part of the Indian Reservation Roads (IRR) Program, closures must be undertaken consistent with the provisions of Title 25 Code of Federal Regulations, Part 170. For roads not designated as part of the IRR Program, closures will be based on the following criteria:

1. Need to protect soil and water.
2. Need to maintain or improve habitat for wildlife.
3. Need to protect critical cultural values.
4. Expected need or use.
5. Safety of expected users.
6. Need to protect the road.
7. Cost of maintenance.

S31. Standard. All new or relocated roads will be located in stable areas outside riparian buffers, floodplains, wetlands, or meadows to the extent possible.

S32. Standard. All roads shall be designed and constructed to limit alteration of natural slopes and drainage patterns to that which will safely accommodate the anticipated use of the road while protecting water quality.

S33. Standard. Roads shall be designed with a drainage system using grade reversals, slope, surface type, ditches, culverts, and/or water bars as necessary to effectively control and disperse surface water to minimize erosion.

S34. Standard. Road drainage systems will be designed so that they are not connected with natural surface channels. Ditch and relief culverts will drain into a protected buffer area a sufficient distance from any surface channel to allow for infiltration.

S35. Standard. Relief culverts will have sufficient slope to drain the ditch and be provided with sediment control structures.

S36. Standard. Relief culvert size and spacing will be determined by the surface area serviced by the culvert, soil type, particle size, relief ditch gradient and other relevant factors.

S37. Standard. All new road construction/reconstruction not completed by the end of the field season, roads with construction completed, and closed roads will have erosion control measures in place at the earliest practicable date. Cut and fill slopes will be planted with seed or seedlings of native plants. Fertilizer and mulch will also be applied.

Air Quality Component

Background

The climate of the Pacific Northwest is heavily influenced by Pacific maritime air masses that result in moist, mild winters and dry, moderately warm summers. Air quality on the UIR is generally good but smoke particulates may exceed U.S. Environmental Protection Agency (EPA) and or ODEQ air quality standards during periods of atmospheric stability in local areas. Prescribed burning and wildfire may increase visible smoke and particulates.

Currently, there is not enough data to demonstrate air quality conditions in the forested lands on the Umatilla Reservation. The CTUIR, through the Department of Science and Engineering, is examining air quality management on the reservation.

Goals and Objectives

Goal: Maintain or enhance air quality.

Objective: Minimize particulate emissions from prescribed burning.

Objective: Minimize adverse impacts to air quality from other management activities.

Standards

S38. Standard. All prescribed burning will be in accordance with state and/or Tribal smoke management plans.

S39. Standard. Available predictive models and methods will be used to minimize impacts of prescribed burning.

Monitoring and Evaluation Component

Background

Implementation of the Forest Management Plan occurs through the identification, selection, scheduling, and execution of management practices to meet the management direction. Implementation of this direction is the key to translating the goals, objectives, and requirements stated in the Forest Management Plan into results on the ground. The Forest Management Plan is implemented through program development and budgeting in conjunction with annual work planning processes.

The Forest Management Plan implementation schedule translates into multi-year program budget proposals that identify the needed expenditures. This process is the vehicle for requesting and allocating funds needed to carry out the planned management direction. Upon approval of a final budget, the annual program of work is finalized and implemented. The accomplishment of the annual program of work is the incremental implementation of the management direction in the Forest Management Plan. The BIA and the CTUIR may be forced to change the proposed implementation schedule to reflect differences between proposed budgets and appropriated funds.

Monitoring is the means of measuring and evaluating the effectiveness of the Forest Management Plan. Quantitative and qualitative information is the means to determine how well assumptions used in the Forest Management Plan reflect actual conditions, how well the goals and objectives are met, and appropriateness of the standards. Monitoring may lead to changes in management practices and provide a basis for adjustment or revision of the Forest Management Plan.

Land managers cannot achieve the goals and objectives contained in any natural resource management plan unless they have the resources necessary to implement the plan. Complex and interrelated management goals and objectives require an intensive effort to gather the necessary information to design and implement specific projects and to monitor the effectiveness of the activities in achieving the management goals and objectives.

Goals and Objectives

Goal: Funding and staffing levels must be adequate to fully implement management direction including a monitoring program.

Goal: Insure that flexibility exists so that management emphasis and strategies remain the same regardless of funding levels.

Goal: Provide sound data on biological, physical, and social parameters to measure the impacts of management on achievement of goals and objectives.

Objective: Identify funds and staff required for implementation.

Objective: Pursue funding and cost sharing sources to carry out the chosen management alternative and monitoring program.

Objective: Use monitoring protocols that measure the relevant biological and physical parameters and that can be repeated.

Objective: Maintain funding and personnel for a monitoring and evaluation program.

Standards

S40. Standard. Monitoring and evaluation must be provided to insure that the standards provided are met or that there is an upward trend towards meeting those standards.

S41. Standard. Monitoring will necessarily be integrated between CTUIR natural resource management and regulatory programs.

Trespass Component

Background

Trespass constitutes one of the major problems in the administration of Indian trust lands on the UIR. Trespass in many cases is willful and involves such activities as gathering fuel wood and mushrooms, hunting big game, use of roads across Indian property to access non-Indian lands, and off-road vehicle traffic. Trespass may also result from established customs and misunderstanding as to the rights of resident non-Indians. The growing population of the area and the increasing popularity of all-wheel drive vehicles have resulted in increased instances of trespass. The Forest Trespass Handbook, 53 IAM 7-H, contains the procedures for investigation of, and collection of, damages for trespass on Indian forest lands as defined under Title 25, Code of Federal Regulations, Part 163.29.

Trespass, as defined in 25 CFR 163.29 "… means the removal of forest products from, or damaging forest products on, Indian forest land, except when authorized by law and applicable federal or tribal regulations. Trespass can include any damage to forest resources on Indian forest land resulting from activities under contracts or permits or from fire." Timber trespass includes both actual theft of logs or trees from the reservation and unlawful or wanton injury or destruction of any tree or trees growing on land belonging to the CTUIR or its Tribal members. Trespass, for the purposes of this plan does not include "the act of entering upon the property of another without permission."

Timber trespass generally occurs due to improperly placed fence lines or incorrectly located or poorly marked property lines; cutting of undesignated trees under contract or permit; or the

cutting of firewood by non-Indians on Indian lands. Trespass may also occur on Indian lands by fire.

Trespass involving improper placement of property lines is very prevalent across the reservation, but especially so within the Diminished Reservation Boundary where trust and fee lands occur in a checkerboard ownership pattern. When the Diminished Reservation was originally subdivided into individual allotments, all property corners were surveyed and marked with brass caps bearing the legal description and the original allottee name. Some of the sections returned to the Tribe under the Johnson Creek Restoration Act were not originally surveyed below the quarter section level. This means that some property corners have never been officially monumented. Some subdivision below the quarter section has been performed by private land surveyors.

Over time, many of the original monuments have been damaged or removed. Restoration of these caps is time consuming and very expensive. Only BLM surveys, or surveys that have been reviewed and approved by the BLM, are recognized as official corners for trust lands. Records should be maintained of any corners that are determined to be missing and added to the BIA Branch of Realty backlog of survey needs. This backlog record is periodically revised and re-evaluated so that any available funds go to the highest priority survey needs.

Goals and Objectives

Goal: Prevent unauthorized use of Indian trust property.

Objective: Investigate accidental, willful, or incidental trespass.

Objective: Assess penalties for the value of products used or removed, cost of damage to Indian land, and enforcement costs incurred as a consequence of the trespass.

Objective: Establish public awareness of the consequences of trespass and solicit assistance from the public in identifying and prosecuting trespass.

Management Strategy

The CTUIR and BIA propose to apply aggressive forest vegetation management, including timber harvest, on all lands with significant portions of the Big Johnson Creek and Isqúulktpe Creek Subwatersheds designated as Special Management Areas (Figure 3-4, Figure 3-5). Special Management Areas are defined as large contiguous land areas of over 1,500 acres that are owned or under the jurisdiction of the CTUIR which do not currently have an adequate road system to allow timber harvest activities without new road construction. Their current condition is such that any existing roads or use of those roads has little if any impact to important resource values such as water quality, endangered species habitat, and/or deer and elk security habitat.

The BIA and CTUIR would not construct new roads in these Special Management Areas to treat timber stands. By designating Big Johnson Creek and Isqúulktpe Creek as Special Management

Figure 3-4. Special Management Areas On The Umatilla Indian Reservation For The Forest Management Plan.

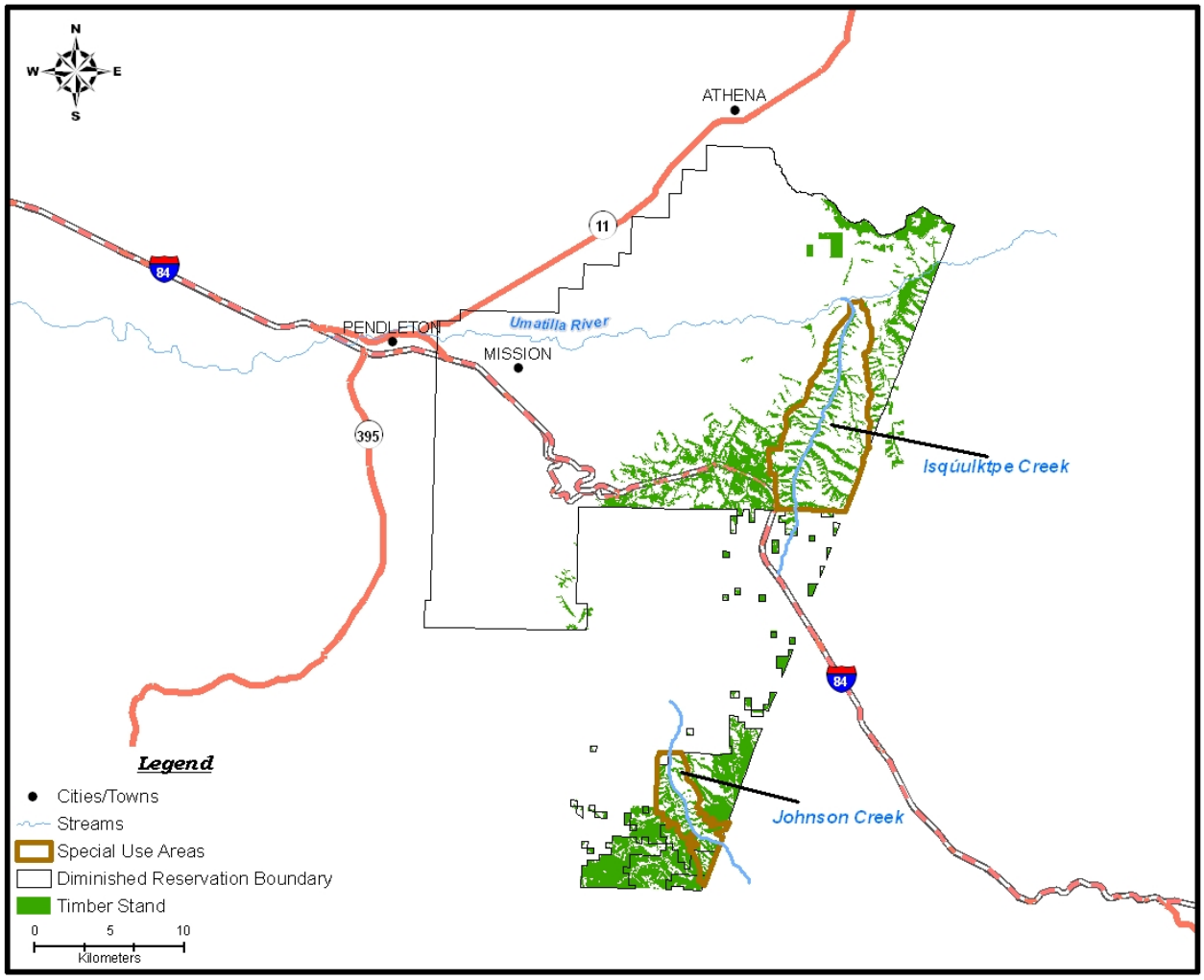


Figure 3-5. Isqúulktpe Creek And Big Johnson Creek Special Management Areas

Isqúulktpe Creek

Big Johnson Creek

Areas, increased protection of core wildlife and fisheries habitat will be provided. Many of the old road systems in the Special Management Areas were located immediately adjacent to, or in the floodplains of, the major streams. The IDT determined that construction of an adequate road system that meets current environmental standards would increase the risk of water quality degradation and loss of deer and elk security habitat. Although it was not evaluated, such construction would most likely be very expensive.

Under this action, the BIA and CTUIR would emphasize improving forest health and reducing fuel accumulations while maintaining a variety of structural stages, particularly late and old stages, on all forested areas of the Umatilla Indian Reservation. The BIA and CTUIR would also emphasize maintenance and enhancement of plant and animal diversity in terms of species composition, distribution, and arrangement. The BIA and CTUIR would use the creation and maintenance of structurally complex stands as the primary approach to managing forests for multiple, complex objectives including the production of wood products.

In the dry forest, there would be a moderate abundance and persistence of mature forest, dominated by stands resistant to low severity fires. The most common species would be ponderosa pine and western larch, with a moderate component of Douglas-fir and a minor component of grand fir.

In the moist forest, there would be a moderate abundance and persistence of young forests consisting of ponderosa pine, western larch, Douglas-fir, and lodgepole pine with a minor component of grand fir. In order to achieve this objective it will be necessary to apply small group selection cuts (up to five acres). There will also be a moderate persistence and abundance of old forests consisting of Douglas-fir and grand fir.

The BIA and the CTUIR would use a variable retention harvest system to retain structural elements of the harvested stand for at least the next entry in order to achieve the identified goals and objectives. Structural retention is a technique for enriching the structural complexity of managed forest stands.

There are three major issues in the development of harvest prescriptions based on the variable retention concept: (1) what structures to retain on the harvested site, (2) how much of each of these structures to retain, and (3) the spatial pattern for the retention--dispersed, aggregated, or in some combination. A variety of individual and stand-level structural features can be conserved during harvest depending on the management objectives. Examples of structural elements include: (1) live trees, especially large-diameter trees, (2) snags, (3) down woody material, (4) undisturbed layers of the forest floor, and (5) forest understory species.

Other treatments aside from timber harvest will be implemented to enhance forest health while maintaining other resources important to the CTUIR. Although timber harvest is the most economical means of stocking control, prescribed fire and pre-commercial thinning can be effective ways to control stocking and prevent fuel accumulation or catastrophic wildfire. Protection of aspen stands from ungulate browsing and/or encroachment by conifers will prevent further decline in the extent of aspen on the UIR.

The BIA and CTUIR will use management regimes directed toward establishment of multiple cohorts. In fire prone forests, maintenance of a large diameter cohort satisfies wildlife and fire resiliency objectives while managing small and medium diameter components for wood production and reduction of catastrophic fire potential. Definition of the large diameter objective varies with site productivity--a range might be 25 to 40 inches DBH. The management regimes are:

NSH Under this regime, timber harvest would not be scheduled (No Scheduled Harvest) in the inner 50% the riparian management zones. These stands will be examined on a case-by-case basis to determine if their condition warrants vegetation treatment to achieve riparian management objectives.

CC The Clearcut Regime will be assigned to lodgepole pine stands. These stands generally do not lend themselves to multi-cohort management. Rotation length will be 60-80 years.

ML20 This Multi-Cohort Regime focuses on producing larger trees and fewer small trees than MS20. Harvests are scheduled to occur every 20 years generally focusing on larger age classes. Foresters often use a "Q-Factor" to describe stand structure under uneven-aged management. The Q-Factor describes the number of trees in a size class relative to the next larger size class. Two inch classes are used to describe the structure. ML20 has a stand structure defined with a Q-Factor of 1.12. Trees are distributed between age classes such that the smaller size classes have just enough trees to grow into larger age classes.

The resulting stands should be more resistant to stand replacing fire. A moderate intensity ground fire could reduce stocking in smaller size classes to the point where there would not be enough trees in the smaller classes to replace trees in the larger classes. These stands may also be somewhat more susceptible to insects or diseases that target larger trees. Stands managed under this regime would have an open and park-like appearance dominated by larger trees.

MS20 This Multi-Cohort Regime stores more of the biomass in smaller trees. Harvests are also scheduled to occur every 20 years generally focusing on smaller diameter trees. MS20 has a stand structure defined by a Q-Factor of 1.3.

The BIA and CTUIR will manage stand density to maintain high stand vigor. No silvicultural approach can contribute as much to forest health as stand density management. Thinning and other density management treatments are an effective way to apply integrated pest management that involves the use of silvicultural measures to reduce susceptibility or vulnerability to wildland fire or insects, diseases, parasites, and other harmful agents.

The BIA and CTUIR will use guidelines established for forest stands in northeastern Oregon to determine appropriate thinning strategies (Tables 3-4a and 3-4b) (Powell 1999). Trees would be selected for harvest in managed stands across all age classes to bring the stand density index (SDI) to between values established for the upper and lower limits of the management zone. These SDI values are available for each species in each plant association found on the UIR in the above mentioned tables.

Many plant associations on the Umatilla Indian Reservation have the ecological capability to support five or more tree species. For mixed species stands, the lowest stocking-level recommendations would be selected. This strategy assumes that the species with the lowest SDI values has the most restrictive stocking requirements and that other species would develop acceptably under the lower densities established for the limiting species (Cochran et al. 1994).

The structure of a stand, e.g. DF32 (Douglas-fir, small sawtimber, moderate stocking), will change over time depending on the silvicultural treatment applied (Figures 3-6a, 3-6b, 3-6c and Table 3-5).

Table 3-4a. Suggested Uneven Aged SDI Stocking Levels By Tree Species For Upland Forest Plant Associations Of The Umatilla Indian Reservation.

PVG	PAG	Plant Association	Ponderosa Pine			Douglas-Fir			Western Larch			Grand Fir			Lodgepole Pine			Engelmann Spruce		
			FS	UZ	LZ	FS	UZ	LZ	FS	UZ	LZ	FS	UZ	LZ	FS	UZ	LZ	FS	UZ	LZ
DRY UPLAND FOREST	HOT DRY	Ponderosa Pine/ Bluebunch Wheatgrass *PIPO/AGSP*	116	33	23															
		Ponderosa Pine/ Idaho Fescue *PIPO/FEID*	169	54	37															
	WARM DRY	Ponderosa Pine/ Common Snowberry *PIPO/SYAL*	277	190	127															
		Douglas-Fir/ Elk Sedge *PSME/CAGE2*	193	75	50	244	184	123												
		Douglas-Fir/ Pinegrass *PSME/CARU*	229	106	71	230	172	115												
		Douglas-Fir/ Common Snowberry *PSME/SYAL*	238	131	88	215	161	108	178	134	90									
		Douglas-Fir/ Mallow Ninebark *PSME/PHMA5*	238	145	97	196	147	98	223	167	111									
		Grand Fir/ Pinegrass *ABGR/CARU*	275	134	90	311	233	156	267	200	134	386	290	193	241	148	99			
COLD UPLAND FOREST	COOL DRY	Lodgepole Pine/ Pinegrass *PICO/ CARU*													194	145	97			
	COLD DRY	Grand Fir/ Grouse Whortleberry *ABGR/VASC*	150	88	59	238	179	119	264	198	132	320	240	160	241	148	99			
MOIST UPLAND FOREST	WARM MOIST	Douglas-Fir/ Creambush Oceanspray *PSME/HODI*	296	219	147	222	166	111												
	COOL MOIST	Grand Fir/ Northern Twinflower *ABGR/LIBO3*	318	147	94	331	248	165	322	242	161	449	337	225	241	148	99	347	260	174
		Grand Fir/ Big Huckleberry *ABGR/VAME*	254	121	81	331	248	165	357	268	178	396	297	198	207	148	99	297	223	149

FS SDI for the full stocking density, uneven aged management
UZ Calculated SDI for the upper limit of the management zone, uneven-aged management
PVG Potential Vegetation Group (Powell et al. 2007)
LZ Calculated SDI value for the lower limit of the management zone, uneven-aged management
SDI The number of trees per acre at quadratic mean diameter of 10.0 Inches
PAG Plant Association Groups (Powell et al. 2007)

Table 3-4b. Suggested Uneven Aged BA Stocking Levels By Tree Species For Upland-Forest Plant Associations Of The Umatilla Indian Reservation.

PVG	PAG	Plant Association	Ponderosa Pine			Douglas-Fir			Western Larch			Grand Fir			Lodgepole Pine			Engelmann Spruce		
			TPA	BA	CCC	TPA	BA	CCC	TPA	BA	CCC	TPA	BA	CCC	TPA	BA	CCC	TPA	BA	CCC
DRY UPLAND FOREST	HOT DRY	Ponderosa Pine/ Bluebunch Wheatgrass *PIPO/AGSP*	33 22	18 12	28 21															
		Ponderosa Pine/ Idaho Fescue *PIPO/FEID*	55 37	30 20	37 30															
	WARM DRY	Ponderosa Pine/ Common Snowberry *PIPO/SYAL*	189 126	103 69	60 52															
		Douglas-Fir/ Elk Sedge *PSME/CAGE2*	74 50	41 27	43 35	184 123	100 67	75 68												
		Douglas-Fir/ Pinegrass *PSME/CARU*	106 71	58 39	49 42	173 115	94 63	74 67												
		Douglas-Fir/ Common Snowberry *PSME/SYAL*	130 87	71 48	53 46	162 108	88 59	73 66	134 89	73 49	60 53									
		Douglas-Fir/ Mallow Ninebark *PSME/PHMA5*	145 97	79 53	55 48	147 98	80 54	71 65	167 111	91 61	64 57									
		Grand Fir/ Pinegrass *ABGR/CARU*	133 89	73 49	53 46	234 156	128 85	79 72	201 134	109 73	68 60	290 193	158 105	87 80	160* 107	87* 58	78* 59			
COLD UPLAND FOREST	COOL DRY	Lodgepole Pine/ Pinegrass *PICO/ CARU*													157* 105	86* 57	78* 58			
	COLD DRY	Grand Fir/ Grouse Whortleberry *ABGR/VASC*	87 59	48 32	46 38	179 120	98 65	74 68	199 132	108 72	67 60	240 160	131 87	84 77	160* 107	87* 58	78* 59			
MOIST UPLAND FOREST	WARM MOIST	Douglas-Fir/ Creambush Oceanspray *PSME/HODI*	218 146	119 80	63 55	167 111	91 61	73 67												
	COOL MOIST	Grand Fir/ Northern Twinflower *ABGR/LIBO3*	140 94	76 51	54 47	249 166	136 90	80 73	242 161	132 88	71 64	336 224	183 122	90 83	160* 107	87* 58	78* 59	259 173	142 94	84 76
		Grand Fir/ Big Huckleberry *ABGR/VAME*	120 81	66 44	52 44	249 166	136 90	80 73	268 179	146 97	73 66	297 198	162 108	88 81	160* 107	87* 58	78* 59	222 148	121 81	81 74

PVG Potential Vegetation Groups (Powell et al. 2007)

PAG Plant Association Groups (Powell et al. 2007)

TPA Trees per acre for uneven aged stands at a quadratic mean diameter (QMD) of 10.0", upper and lower management zones

BA Basal Area per acre for uneven aged stands, QMD = 10.0", upper and lower management zones

CC Calculated canopy cover for uneven aged stands at upper and lower management zones

* Upper and lower management zones for TPA and BA for Lodgepole Pine are for irregular structure; Canopy cover is for managed stands (stands thinned early in life (<9').

Figure 3-6a. A DF32 Timber Stand Under A No Harvest Silvicultural Prescription.

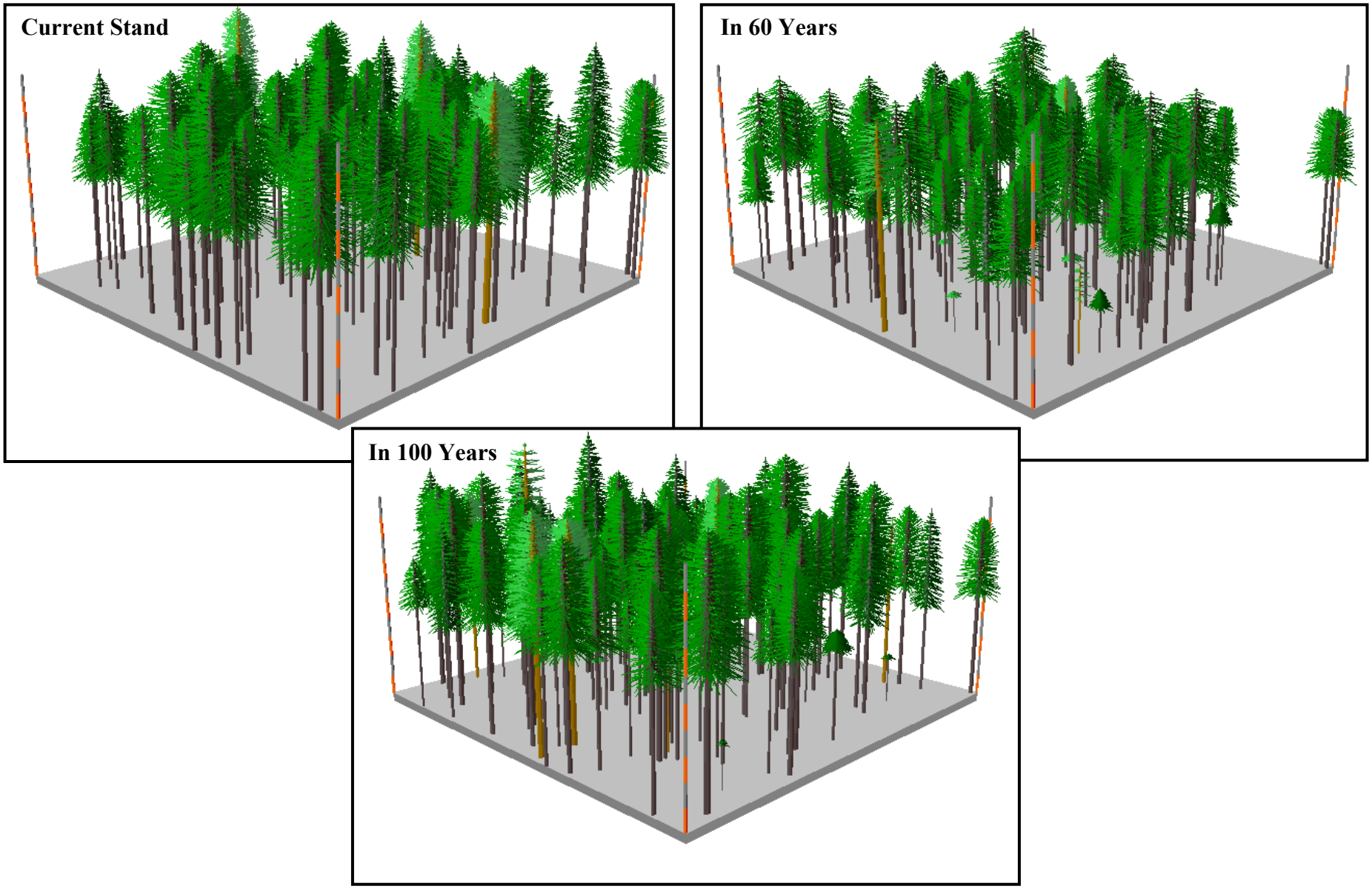


Figure 3-6b. A DF32 Timber Stand Under A ML20 Silvicultural Prescription.

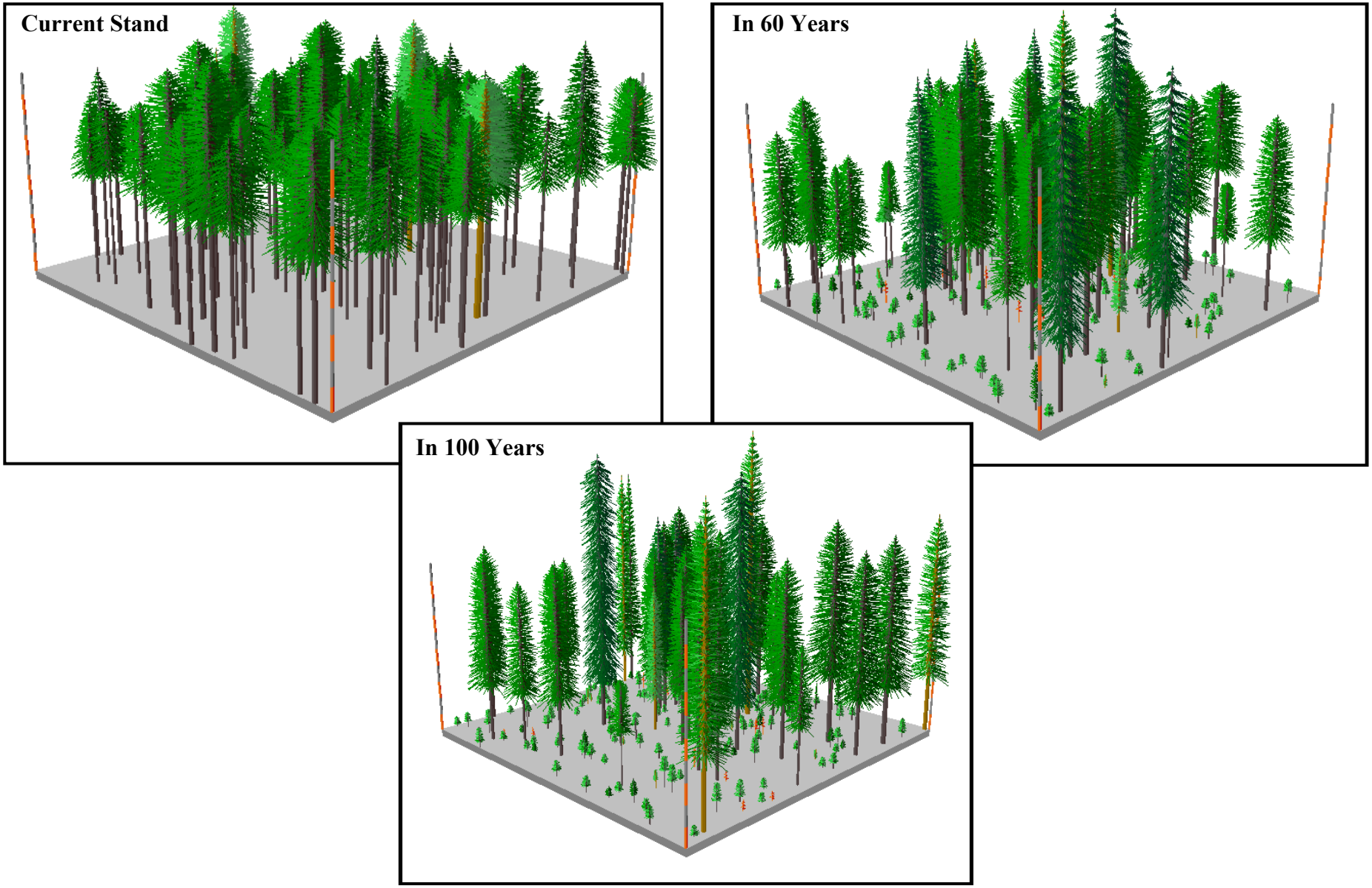


Figure 3-6c. A DF32 Timber Stand Under A MS20 Silvicultural Prescription.

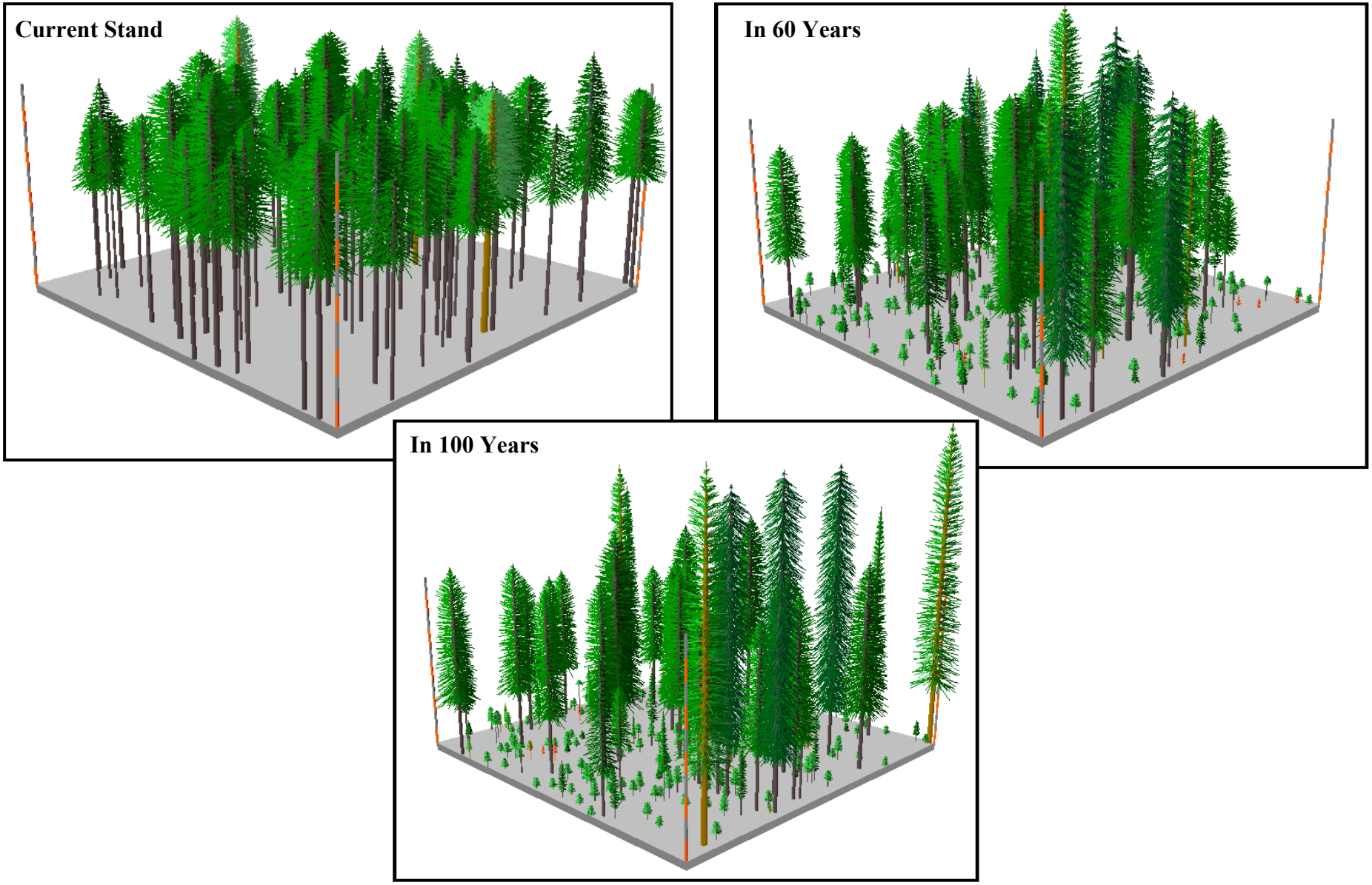


Table 3-5. Statistics For A DF32 Timber Stand Under Three Management Regimes.

	All Trees			Merchantable Trees (DBH > 8")			
	TPA	DBH	BA	TPA	DBH	BA	MBF/AC
Current Condition	125	15.4	163	125	15.4	163	19.5
No Harvest							
+ 60 Years	116	17.4	191	116	17.4	191	27.6
+ 100 Years	105	19.4	216	105	19.4	216	35.6
ML20							
+ 60 Years	226	9.2	104	51	19.2	102	18.2
+ 100 Years	215	9.1	97	43	20.2	96	21.3
MS20							
+ 60 Years	256	8.2	95	50	18.4	92	16.2
+ 100 Years	249	8.1	90	44	19.2	88	19.1

Marking Guide

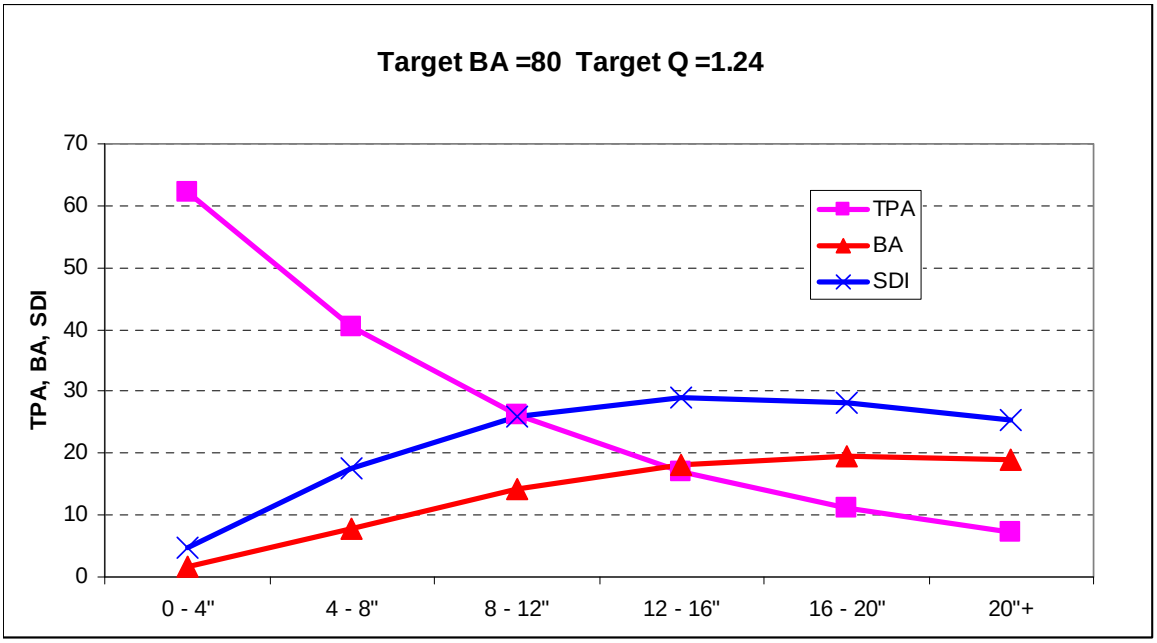
- For most stands, the planning objective is to create stands with two or three size classes. Even-aged management through clearcutting or shelterwood, however, may be the more appropriate regime for lodgepole pine stands, stands heavily impacted by insect or disease, or fire salvage.

- For the purposes of projecting future harvests and management, the CFI inventory was used to estimate average stand characteristics for strata defined by species, size and stocking classes. The current and projected stands were compared to generalized diameter distribution curves to estimate average harvest opportunities at each scheduled entry.

- Table 3-4b above shows more specific targeted stocking levels by species group and plant association. This table can be used to create more site-specific stocking objectives and marking guides.

  The spreadsheet *CTUIR_Diameter_Distributioin.xls* can be used to create desired stocking distribution guides, like the one shown below (Figure 3-7). Note that the spreadsheet may not leave enough trees to meet the snag recruitment guidelines.

Figure 3-7. Example of a Stocking Distribution Guide



- Actual stand conditions will vary from the averages used in the planning models, and the silvicultural prescriptions may be further modified to fit actual stand conditions. Consider the following:

    - Many stands are currently even-aged. It may take several entries to transform these stands into multi-cohort stands.

    - Heavily stocked stands may need a thinning/sanitation entry to improve tree vigor before initiating a cut designed to create regeneration.

    - In general, no more than 50% of stand basal area should be removed in a single entry.

Other successional and disturbance processes will be maintained through endemic insect and disease perturbations and fire.

The BIA and CTUIR will also seek opportunities in stands that have not reached commercial size on both allotted and Tribal lands to implement a thinning program designed to improve forest health. In this program, shade intolerant species would be favored over shade tolerant species. Thinning costs are expected to approach $250 per acre.

The BIA and CTUIR will develop a fire management capability to use prescribed fire and mechanical fuel reduction methods as a means of reducing stocking levels and fuel loads. The

BIA and CTUIR anticipate that as trained personnel become available, together with apparent increased emphasis at the national level on reducing the potential for large scale-high severity catastrophic wildfires, prescribed fire use will increase on the UIR combining the need to reduce fuel loads with other wildlife habitat improvements or restoration of native plant communities. Between 300 to 500 acres could be treated each year once the capability is in place. Costs for mechanical fuel treatments range from $600 to $1,000 per acre. Costs for prescribed fire (under burning) range from $300 to $500 per acre in the first entry and $50 to $120 per acre during subsequent entries. Activity fuel treatment costs range from $100 to $200 per acre.

Chapter IV - Implementation of the Forest Management Plan

Introduction

Implementation of the Forest Management Plan occurs through identification, selection, scheduling, and execution of practices that meet the management direction adopted by the BIA and CTUIR. Implementation of the management direction is key to translating the stated goals, objectives, and management requirements into results on the ground. The management goals and objectives described in Chapter III--Forest Management Direction, provide the driving force for project selection and scheduling. The BIA and CTUIR will implement the Forest Management Plan through development and implementation of annual work plans and budgets.

Implementation guidance provides for development of multi-year programs to address: (1) current and future inventory needs to determine the condition of forest resources, (2) vegetation treatments to control tree density and address forest health issues, (3) forest development activities to improve productivity of the forests, (4) wildland fire management to support forest management activities, (5) early detection of insect and disease outbreaks, (6) control of the spread of invasive species, (7) prevention of the unauthorized use of forest resources, and (8) the monitoring and evaluation process.

Present and Future Inventory Needs

Background

The purpose of a forest inventory is to provide current and accurate information concerning the forest resource in order for managers to make informed decisions. Forest inventory information can include:

1. Forest Structure and Composition

    - Species Composition
    - Size Class
    - Stocking Class
    - Basal Area (Square Feet Per Acre)
    - Stand Density Index
    - Volume (Board Feet Per Acre)

2. Forest Productivity and Health

    - Growth and Mortality by Species

- Number of Snags and Down Logs by Species and Forest Type
- Insect and Disease Incidence by Species and Forest Type
- Fuel Loads and Wildfire Risks

Procedures and sample intensity vary in accordance with the purpose of the inventory. Information required for management decisions can change over time, therefore the design of the forest inventory system attempts to anticipate future information needs. The intended use of the inventory information and availability of funds are the primary factors in determining the data to be collected and maintained for management purposes.

There are four general types of inventories necessary for forest management on the UIR:

- Forest Inventory for Strategic Management Planning (Continuous Forest Inventory)
- Forest Inventory for Site Specific Stand Management (Proposed Stand Exams)
- Forest Inventory for Forest Product Sales (Timber Sale Cruise)
- Forest Inventory for Real Estate Values (Realty Cruise)

Forest Inventory for Strategic Management Planning (Continuous Forest Inventory)

The Continuous Forest Inventory (CFI) is designed to provide a periodic overview of average conditions and dynamics of the forest including information on stocking, growth, mortality, and health. Under the CFI, permanent plots are established and periodically re-measured throughout the forest. The CFI uses limited sampling intensity to determine within reasonable degrees of accuracy the volumes, growth and conditions over the entire forest.

CFI data needs to be collected on approximately a ten to fifteen year cycle. The CFI plots are arranged on a regularly spaced grid at 0.275 mile intervals across Tribal and allotted trust lands. Each plot is $1/5^{th}$ of an acre in size. The initial installation of 306 CFI plots on the UIR occurred in 1990. These plots were re-measured in 2003. At the same time, an additional 10 plots were installed on trust forestlands that had previously been classified as non-forest. The data from these inventories was used to develop an Inventory Analysis Report (Fairweather 2009). Field procedures for data collection are documented in the 2003 CFI data manual (BIA 2003).

Based on the ten to fifteen year re-measurement cycle, the Forestry Program should collect information on forest conditions from the existing 316 CFI plots sometime between 2013 and 2018. The BIA has limited funding available through the Forest Management Inventory and Planning budget line item for re-measurement of the CFI plots and analysis of the information. The BIA maintains a schedule of activities and requests funds on an annual basis when projects are scheduled. Major CFI inventory steps include acquisition of aerial photography, mapping and digitizing of timber types, updating the field procedures manual, re-measurement of the CFI plots, and processing and analyses of the inventory data. Completion of all inventory segments may require approximately four years.

Additional CFI plots may be needed to address the following:

- The addition of acres to the forest base through planting of idle agricultural lands.
- The acquisition of existing forest lands by the CTUIR.

Forest Inventory for Site Specific Stand Management (Proposed Stand Exams)

Recently, many forest landowners have established stand based inventory systems to obtain more site-specific information for planning purposes. The CFI provides estimates of growth and mortality for the forest as a whole. This approach gives a reliable estimate of tree and stand parameters for the entire forest, but it is very weak in providing site-specific details within the forest. A stand based inventory system gives planners better information, including spatial relationships, when dealing with multiple resource values. The conflicting demands for forest management among multiple resources on each acre of forest land have elevated stand silvicultural prescriptions to a spatially complex problem. A stand based inventory system is able to identify which timber resources are in conflict with other resources and how to establish linkages between vegetation, regulation, silviculture, topography, and access on the ground.

In stand based inventory systems, a stand is the basic building block of information. A stand represents a contiguous area designated for management under a harvest prescription or silvicultural regime. A stand originates normally from larger timber types/forest polygons which are defined using tree species, size and stocking stratification only. Smaller polygons/stands are then defined by additional boundaries such as roads, streams, ridges and physical access for purposes of economically efficient management practices. These stands become the basis for long-range planning.

In the stand based inventory approach we would need to tally all species and size classes of trees, tree growth, and physical site attributes in order to develop a good stand inventory for long-term planning. The most representative sample design consists of a systematic grid of parallel line transects. Plots would be located along the parallel line transects with a general rule of obtaining one plot per four acres. At each sample point, a variable radius plot and prism factor would be used that selects approximately 5-8 trees over 5 inches DBH for measurement of DBH, height, and/or age. A fixed area plot should be used for all trees less than 5 inches DBH. The radius for this fixed area plot may be any convenient size that picks up an average of four or more trees per plot. All trees should be tallied that are greater than 12 inches in height to record potential in-growth over the next few years.

The stand based inventory design should also be used for timber sale and realty cruises. The site-specific stand based inventory system would then be uniform, providing both the flexibility and resolution to satisfy many users simultaneously.

If the decision is made to accept and implement a stand based inventory system, the Forestry Program should delineate stands and then sample approximately 10-15% of the stands in each stratum each year of the inventory effort. Foresters will determine the strategy and priority of

selecting stands for examination. At this rate of sampling, the Forestry Program will need 7-10 years to fully implement a stand based inventory. Obviously the implementation of a stand based inventory system will require significant commitment of manpower and funds. The costs and benefits of this inventory approach will need to be carefully evaluated before adopting this system.

The permanent CFI plots should be maintained in a database independent from the stand based forest inventory database. They provide a basis for testing and calibrating the growth models. The pairing of the stand based forest inventory with a CFI calibrated regional growth model would provide local growth and mortality projections that may be applied to each stand in the inventory independently. The real advantage is that independent silvicultural regimes may then be applied to each stand based on the observed physical, biological and regulatory parameters of that specific stand.

Forest Inventory for Forest Product Sales (Timber Sale Cruise)

Inventories for timber sales must provide data of sufficient quantity and quality to support accurate stumpage appraisals for advertisement and sale purposes. Accuracy of the stumpage appraisal is dependent on the estimate of the volume and quality of timber to be cut from a proposed timber sale area. Errors can result in considerable financial loss, either to the seller or to the purchaser.

Unit maps delineating harvest areas, ownership, transportation system, topography and operability should be prepared for all proposed timber sale units. The final maps should be to known scale so that accurate measurements may be made. All acreage figures used for expanding per acre volume figures to arrive at total volumes shall be measured on the final unit map unless ground traversed. The use of GPS units and GIS mapping software can greatly improve the accuracy of harvest unit maps and acreage calculations.

The inventory or cruise design, other than those involving 100 percent cruises, shall utilize unit samples that can be statistically analyzed for sampling accuracy. Plot locations should be evenly distributed throughout the harvest unit. The sampling error for the volume and value to be cut on pre-determined sales should not exceed five percent (5%) in terms of one standard deviation (the 67 percent confidence limit). For estimated volume sales, sampling errors should be established with consideration of timber values, in addition to logging and unit development costs. The sampling error in cut volume and value for estimated volume sales should not exceed 15 percent (15%) in terms of one standard deviation for the entire sample, or individual strata utilized for separate appraisal purposes within the sale. Pre-determined volume sale cruises should be completed within two years of the sale advertisement, while cruises of estimated volume sales can be within five years of advertisement.

Currently, all cruises are processed with the commercial software, SUPER A.C.E. by Atterbury Consultants, Inc. SUPER A.C.E. calculates board foot volumes using the variables of DBH, height, and form class. SUPER A.C.E. runs on personal computers and data can be input by

hand or through data transfer from field data collectors. The user has the ability to combine sample units and select from a wide variety of output reports.

Forest Inventory for Real Estate Values (Realty Cruise)

A real estate appraisal is required for any transaction resulting in the sale of trust lands. Timber is part of the "real property" and must be included in the real estate appraisal of forested trust lands. To complete the real estate appraisal, the Real Estate Services Program will request a realty cruise from the Forestry Program for all forested trust properties. Estimates of the volume of trees from this type of inventory are used by the appraiser to develop the fair market value of the property.

There has been a significant increase in the number of realty cruises in the past few years. This is mainly due to the CTUIR Inheritance Code and increased emphasis on land consolidation. The general intent of the CTUIR is to prevent trust lands from passing to non-Indian ownership or to ownership by Indians not enrolled with the CTUIR.

All realty cruise reports should include information concerning the location of the property, a brief description of the access, and the acreage of timber coverage. Pre-commercial timber stands can be described in terms of species and size class and total acreage. No cruise information such as trees per acre, basal area, or average diameter and height should be necessary for the pre-commercial forestry component. Since commercial-sized trees can contribute a significant value to the total appraisal, more detailed information is required.

A determination of whether or not a timber stand is economically harvestable is subjective and needs to be based on professional judgment. Since many allotments are not fully forested and may only contain a stringer of timber, it is not reasonable to determine the economics solely on the acreage of the one property. The cruiser needs to evaluate the general area to determine if sufficient forested trust ownership could be included in the area to support a timber sale. In the same manner, the general access to the area needs to be determined. In many cases there is not legal access to an individual property. However, we should assume that if an adequate road accesses the property that the necessary right-of-ways could be obtained. The report should include a good description of the number and type of ownerships that would need to be crossed to access the property so the appraiser can consider potential right-of-way costs. In some situations, the cost to obtain access can exceed the potential value of the timber. This is especially true where new road construction is required.

All standards for the Forest Management Plan must be considered in evaluating the potential merchantability of a timber stand. The amount of area within the inner one-half of any Riparian Management Zone should be calculated and reduced from the potential commercial timber acres. The cruiser will then need to determine what type or types of logging systems could be employed. Based on these evaluations, if logging and associated costs make management uneconomical, the property should be considered non-commercial and no detailed cruise will be required. A thorough explanation of these issues should be included in the report.

Timber Harvests (Vegetation Treatments)

Policy

Timber harvest via timber sales is the primary tool used to manipulate forest vegetation and move the forest toward the desired future condition. Timber sales shall be designed to meet management goals and objectives and will utilize the silvicultural prescriptions described in Chapter III. Several types of contracts and cutting permits can be utilized for the sale of timber. Standard BIA contract or cutting permit forms which comply with the requirements of Title 25, Code of Federal Regulations, Part 163, shall be utilized for all commercial timber harvest on trust lands. Sales are generally advertised on the open market and awarded to the highest bidder. The various types of contracts and permits, along with a brief description are listed below:

- **Timber Contract for the Sale of Estimated Volumes**: This type of contract is used for sales of timber in which the actual volumes used as a basis for payment are determined by a scale or other measurement of the products after cutting. Sales with an estimated value over $25,000 will usually be by this type of contract.

- **Timber Contract for the Sale of Pre-Determined Volumes**: This type of contract is used for sales in which the volumes have been determined prior to the sale. Payment is made for the specified amount regardless of whether the actual volume harvested is more or less than the volume specified in the contract.

- **Paid Timber Cutting Permit**: This permit may be used for timber harvests when volumes and values are sufficiently small enough that formal contracts are deemed unnecessary (generally less than $25,000). It is applied primarily to salvage and other small, unscheduled harvests

- **Free-Use Permit**: This permit may be issued to an individual Indian, or organized group of Indians, authorizing the harvest of specified forest products at no charge to the permittee. The estimated value harvested under this authority by any individual or organized group shall not exceed $5,000 in a fiscal year.

- **Special Allotment Timber Cutting Permit (SATCP)**: This permit may be issued only to an allottee that is the sole owner of a specific allotment and is therefore rarely employed. As a condition to being granted the permit, the sole allotment owner is required to provide evidence that he or she has arranged a bona fide sale of the forest products on terms that will protect the allottee's interests. The Forestry Program shall designate the timber to be harvested and will provide appraisal, silvicultural guidelines, and forest management requirements to be utilized in the harvest. The SATCP is issued with the understanding that the allottee is required to furnish an acceptable performance bond, to manage the harvesting operation including the logging and marketing of forest products removed, and to pay the forest management deductions.

Sale Planning and Administration

The Forestry Program will be responsible for the management of all forms of timber harvest on allotted and Tribal trust lands as well as Tribal fee lands from identifying the need for treatment through to timber sale preparation and administration. This section will briefly describe the activities involved in the timber sale process. More specific information may be found in the Contract Sales of Forest Products Handbook (53 IAM 3-H) and the Permit Sales of Forest Products Handbook (53 IAM 4-H). The timber harvest function is divided into the broad categories of sale preparation and sale administration.

Timber Sale Preparation

Timber sale preparation includes all phases of field work, correspondence, and documentation required in the preparation of a timber harvest. The level of documentation and specific harvest preparation procedures vary depending on the value of the sale and the property ownership classification. The primary tasks of timber sale preparation are:

- Survey area, locate property boundaries
- Secure necessary right-of-way and crossing permits
- Correspond with allottees and obtain power-of-attorney
- Design silvicultural prescriptions
- Coordinate interdisciplinary review and prepare necessary NEPA documents
- Design and lay out roads or road improvement standards
- Mark and cruise timber, determine volume and stumpage appraisal
- Prepare contract or permit documents
- Develop sale prospectus and advertisement
- Conduct bid opening and award contract

Identification of Harvest Areas

Timber harvests are generally initiated in one of three ways: as harvests scheduled through the forest management planning process, as allottee requests, or in response to imminent tree mortality and associated salvage needs. Most sales should be in accordance with the harvest schedule developed through the forest management planning process. For allotted trust and Tribal fee lands, individual tracts will be grouped together for overall management efficiency. Individual allotment sales can also be initiated by requests from allottees; however, these generally attract less purchaser interest and therefore provide a lower return to the owners. In addition, sale preparation and administration of individual allotments is less efficient use of staff time. Paid permits are most often initiated in response to salvage of damaged timber from insects, diseases, fire or other weather related damage. Although these are the most typical scenarios, sales and permits on all properties could be initiated in response to one, or a combination, of these motives.

Sale Area Reconnaissance

Once a potential timber harvest has been identified, the area is analyzed by forestry staff to determine appropriate silvicultural treatments and identify other critical characteristics of the sale area. During this reconnaissance, observations are made regarding the composition and condition of the timber stand, other vegetation, habitat types, land forms, and road access. These observations are then summarized and presented to an IDT with estimates of volume to be removed and recommendations for harvest treatments, road work, site preparation, reforestation, and any other activities prescribed by the forestry staff.

Interdisciplinary Review

An IDT will be formed to review proposed activities for consistency with the goals, objectives and standards of the Forest Management Plan. Depending on the proposed project, an IDT could include representatives from the following programs: Water Resources, Fisheries Management, Wildlife Management, Forest Management, Range Management, Fire Management, Cultural Resources Protection, Planning, Public Works, and Geographic Information Systems. The IDT will identify areas of concern and potential solutions to these issues during meetings and a field tour of the proposed project site. IDT members will be expected to provide written comments which will be included in the timber sale files.

Environmental Review, Biological Evaluation and Cultural Resource Surveys

The potential impacts on the human environment, potential adverse impacts to threatened and endangered species and their habitats, and any adverse impacts to cultural resource or historic properties must be understood and documented in compliance with the requirements of the National Environmental Policy Act of 1969, the Endangered Species Act of 1973, and the National Historic Preservation Act of 1966. Formal consultation with either the U.S. Fish and Wildlife Service or NOAA-Fisheries Service is mandated if threatened or endangered species or their habitats may be adversely impacted by the proposed action.

The Forestry Program will comply with the environmental review requirement for most vegetation treatment projects through development of an Environmental Assessment (EA) resulting in a Finding of No Significant Impact (FONSI). Approval of free-use cutting without a permit; approval and issuance of cutting permits for forest products not to exceed $5,000 in value; or approval and issuance of paid timber cutting permits or contracts for products valued at less than $25,000 when in compliance with the policies and guidelines established by this management plan may qualify as a Categorical Exclusion (CE). An Exception Review Checklist is completed on all CE's to see if completion of an EA is necessary. Should the EA determine that a FONSI cannot be supported, an Environmental Impact Statement would need to be prepared for the proposed action.

The Forestry Program will also be required to prepare a Biological Evaluation documenting the effects of the proposed action on federally listed endangered or threatened species (U.S. Fish and Wildlife Service 1998). The methods outlined in the NOAA document "Making Endangered Species Act Determinations of Effect for Individual or Grouped Actions at the Watershed Scale"

will be used to determine possible impacts of any proposed project. In addition, the Magnuson-Stevens Fishery Conservation and Management Act, as amended by the Sustainable Fisheries Act of 1996, requires federal agencies to consult with NOAA on activities that may adversely affect Essential Fish Habitat (EFH).

The objective of the EFH assessment is to describe potential adverse effects to designated EFH for federally managed fisheries species within the proposed action area. It also describes conservation measures to avoid, minimize, or otherwise offset potential adverse effects to designated EFH resulting from the proposed action.

Cultural resource inventories shall be conducted on each proposed timber sale (or other ground disturbing activity) in compliance with Section 106 of the National Historic Preservation Act. The goal is to identify and delineate areas of cultural and archeological importance. Once identified, sites are protected based on determinations of cultural significance and potential for eligibility on the National Register of Historic Places. New ground surveys will need to be conducted on every proposed timber sale unless a survey has been done within the previous 5-10 years. The final report shall be submitted to the Tribal Historic Preservation Office (THPO) for review and approval.

Sale Layout

Prior to initiating any field activities, property boundaries and proposed cutting boundaries are located on the ground. The property is first located and drawn on maps and aerial photographs. Field and file searches are conducted to locate and document legal property corner monuments. If the information is adequate, the property boundaries are re-established and marked on the ground (red flagging or paint). If property corners cannot be located, or are inadequate for the proposed project, the project will need to be delayed until an appropriate cadastral survey can be conducted. Most surveys of trust properties should be conducted by the BLM. Surveys by the BLM are expensive and very time consuming and there is currently a lengthy backlog of survey needs on the reservation.

Access to the proposed sale needs to be determined. Adjacent property owners are identified as well as any existing rights-of-way. The need for temporary crossing permits is determined and permits are either obtained or the requirements for the purchaser to obtain permits are developed.

Most sale access for the first decade of the plan period will be on existing roads. Many of the access roads are low standard native surface roads that follow major topographic features such as ridges and streams. Until recently, there has not been an on-going maintenance program for BIA and Tribal roads. Any maintenance of these roads will be coordinated between the Forestry Program and the Transportation Program in the Department of Public Works.

In the absence of a Transportation Plan which defines long-term road development objectives or road standards, road improvement and maintenance requirements will be developed on a project by project basis. Road improvement needs such as road rocking, drainage structures, and road closures should be identified and documented by the IDT. Sale planners need to consider how required road maintenance and construction requirements can increase purchaser costs and

thereby decrease economic return to the landowners. Sale planners should also consider how roads can be an investment for the CTUIR with potential for long-term use.

Consent of Owners

On Tribal properties, the consent of owners is established at the beginning of each planning period with the approval, by resolution, of the Forest Management Plan. The details of each specific timber sale or timber cutting permit involving Tribal ownership is also approved by resolution prior to sale advertisement. Supporting resolutions should include designation of the authorized Tribal representative to sign as seller on final contract documents.

On allotted properties, the consent of the owners is acquired by obtaining Power-of-Attorney documents for a simple majority of the ownership. A current Title Status Report can be obtained from the BIA or through the Trust Asset and Accounting Management System (TAAMS). Letters and Power-of-Attorney forms shall be prepared for all undivided interest owners requesting return correspondence within a three week period (the Superintendent holds the power-of-attorney for all trust estates). If no response is received (positive or negative), a second request shall be sent to all non-responding owners. If majority consent cannot be obtained after two mailings, the sale planners should consider removing that property from the proposed sale. The consent of a majority of the ownership should be secured prior to initiating any timber sale preparation on allotments.

If the Superintendent determines that it is in the best interest of the allottees to proceed, he or she can approve a timber harvest without prior consent of a majority of the allotment ownership to prevent loss of value due to fire, insects or diseases, windthrow, or other catastrophes (Title 25, Code of Federal Regulations, Part 163.14(b)).

Volume Determination and Stumpage Appraisal

All units are marked and cruised prior to the award of a timber sale. The following marking guides provide the timber markers with the information they need to meet the silvicultural prescription. Individual harvest units may have either "cut trees" marked (blue paint) or "leave trees" marked (orange paint), but not both.

- The objective driving marking trees is to maintain or improve the health and vigor of the residual stand.

- Compare the pre-sale cruise to the desired distribution. Focus on removing trees in size classes with the most excess. If there are deficits in some size classes, consider making adjustments to compensate.

- In general, do not mark pre-merchantable trees. If there is a deficit in pre-merchantable size classes and concerns about successful regeneration from the current cut, consider sale provisions that will protect the smaller trees. If there is a large post-harvest surplus of pre-merchantable trees, consider a forest development project to thin down to the desired level.

- When marking, tree vigor and form are more important than spacing. In general, leave larger, better trees of the preferred species.

- Snags and snag recruitment targets are calculated on a per acre basis, but within a sale area, clumps of snags are preferable to an even distribution.

Methods used for cruising timber vary from unit to unit and from sale to sale depending on the size of the unit and the characteristics of the timber. Most of the timber cruising is accomplished by variable plot cruising, 100 percent cruising, or a combination of both methods. Strip cruising is also used, but less frequently. Cruises should be conducted after the timber has been marked so accurate volume estimates may be determined.

The sampling error for the volume and value cut on pre-determined sales shall not exceed five percent (5%) in terms of one standard deviation (the 67 percent confidence limit). For estimated volume sales, sampling errors should be established that take timber values, logging and unit development costs into consideration. In the case of estimated volume sales, the sampling error in basal area or cut volume and value for the entire sample or individual strata utilized for separate appraisal purposes within sales, shall not exceed fifteen percent (15%) in terms of one standard deviation.

Estimated removal volumes are calculated using the commercial software program SUPER A.C.E. A number of reports are available from this program summarizing information by unit and species or product groups. Minimum advertised stumpage rates are calculated for each species or product group by deducting estimated logging costs from local delivered log values.

Logging Methods

Logging methods which may be used are separated into three general categories: ground-based yarding, cable systems, and aerial or helicopter yarding. On level ground and slopes of up to 40%, ground-based yarding systems are the preferred method for harvesting timber. These systems are generally less expensive, more commonly available, and require less skill to operate than other systems.

Because logs are yarded with machinery operating directly on the ground, the potential for adverse site impacts with ground-based yarding is the highest of all the logging methods. However, skilled operators and good planning will generally result in minimizing site impacts. Skid trails and skidding operations will be designed and located to minimize soil disturbance. Ground skidding equipment should be restricted to dry, stable, well drained soils to minimize compaction. Temporary roads, skid trails and landings will be flagged by the sale operator and approved by the Timber Sale Officer prior to harvest. Examples of equipment used with these ground-based yarding systems include crawler tractors, rubber-tired skidders equipped with either winch line or a grapple, track mounted excavators used for “shovel logging”, mechanized feller-bunchers, and swing-boom de-limbers. Timber sale contracts generally allow the operator to select the type of ground-based system and the specific equipment to be used on a timber sale. However, the contract can specify the type of equipment if the IDT identifies advantages of one particular system for the sale area.

Cable yarding systems are characterized by stationary machines which support two or more drums of cable and an upright boom or tower. The yarder is typically stationed at the top of a slope with the tag end of the skyline cable secured at the bottom of the unit. The skyline provides vertical lift to a mainline which functions as an elevated winch line. These systems are generally more expensive than ground-based systems and require a higher degree of skill to operate. They are typically used in harvest units that are accessible by road on slopes in excess of 40%. Potential impacts to the ground are generally less than those with ground-based systems, but may become more severe if used without care. Cable yarding may require construction of new roads on upper slopes to provide adequate deflection for the system. In addition, cable systems typically require removal of a higher percentage of the total standing volume to operate safely and economically.

Helicopters could be employed to remove timber from steep, inaccessible areas. This type of system could be required for logging in the restricted areas of Isqúulktpe and Big Johnson Creeks, and other steep areas. Helicopters provide full suspension of logs thereby minimizing ground disturbance and eliminating the need for skid trails and roads. However, landings will increase in size compared to all other systems. The diameter of the drop zone should be at least 2 ½ times the length of the longest log to be yarded. The decking area must be able to hold approximately 2 days production. A service area pad also needs to be provided that is at least 2 times the rotor diameter. This is usually a separate landing or area removed somewhat from the drop zone. Obviously, all landing areas need to be located on suitable standard haul roads.

Helicopter yarding is the most expensive of the yarding systems. Helicopters utilized for logging come in a variety of sizes depending on the size of timber, the size of the job, and the yarding requirements. Yarding can be both uphill and downhill to suitable landing areas. However, it is best if the majority of the volume is delivered downhill. Larger ships can haul larger loads and slightly longer distances. However, larger ships require larger total sale volumes to make the system economically viable. The average haul distance should be limited to ½ to a maximum of ¾ mile. Smaller total volumes and longer haul distance may become economically viable for higher valued species and sorts.

Due to the very high cost of helicopter logging, it is assumed that use of this system will have very limited application. During very good market conditions, log values may allow helicopter logging operations. The ability to use helicopter yarding will depend on the timber market conditions and may not allow harvest or treatment of lower value species and size classes.

Slash Management

Slash generated during commercial logging operations will be the primary source of activity fuels on the Umatilla Reservation. Slash hazard reduction requirements are included in all timber sale contracts and timber cutting permits as a primary mechanism for reducing the threat of wildfires. Proper management of pine slash is also critical in reducing the hazard of bark beetle infestations. Slash abatement techniques include lop and scatter, whole tree harvesting, prescribed fire, and piling and burning of slash. The type of harvest system utilized as well as the volume of timber removed during the harvest will influence the type of slash management

utilized. Other factors, including silvicultural objectives, marketability of pulp, wildlife habitat objectives, size and location of the operation, and land ownership will influence the slash management strategy employed.

The lop and scatter technique may be used in harvests with low to moderate volumes removed per acre. The loggers are required to limb and top the trees where they fall in the woods. The residual slash is then cut into short lengths and scattered on the ground so that it does not exceed two feet above ground level. The effect of this technique is to eliminate ladder fuels and to disperse heavy concentrations of fuel. Heavy concentrations of slash may require piling. This method provides positive benefits to long-term soil productivity and small mammal habitat.

A technique similar to lop and scatter is to lop and crush the logging slash. This is the most common method used when logging is accomplished with mechanized harvesters or faller-buncher type equipment that is capable of de-limbing trees in the woods. The harvester cuts the tree and then limbs the tree in front of the tracks. Trees may be bucked into appropriate lengths and/or positioned to facilitate hauling or skidding. The mechanical harvester walks forward on the slash as it continues the process. The weight of the machine crushes the slash into close ground contact. In turn, the slash under the tracks of the harvester tends to cushion the vehicle and disperse the weight of the machine, reducing or eliminating ground compaction.

Whole tree harvesting may also be used with mechanized harvesting systems. The harvester cuts and positions the whole tree for skidding to the landing. The majority of the slash generated on the site is brought into the landings where the tree is de-limbed and bucked into appropriate lengths. The landing slash is piled for burning. This practice results in a minimal amount of slash left on-site in the woods and can expedite site preparation activities. Due to the large amount of slash accumulated at the landings, significantly larger landings may be required. Because little or no slash is left behind in the woods, whole tree harvests are not constrained by removal volumes.

Piling and burning occurs to some extent on almost all sales. At a minimum, landing slash is piled and burned on most sales. Due to the amount of ground disturbance, machine piling over the entire harvest area is rarely done unless it is done in conjunction with site preparation. Portions of sales may be machine piled and burned to deal with heavier slash concentrations and higher fire danger situations. When machine piling, use of the lowest ground pressure equipment capable of meeting the objectives will minimize soil impacts. Some slash should be left on the ground to help cushion the vehicle and operations should be restricted to low soil moisture conditions to reduce the potential for compaction. Dozers should be restricted to brush blades and the blades should be held off the ground. Grapple equipment (loader, excavator, etc. with a bucket and thumb) is preferred for piling of all slash. These machines are better able to construct compact piles and separate all dirt from the burnable material.

Prescribed fire is used in a number of ways on harvest units to treat slash. All prescribed fire requires completion of a detailed burn plan specifying the conditions under which the burn may occur and the objectives of the burn. Broadcast burns may be utilized on regeneration harvests where most of the timber volume has been removed and site preparation is required. Harvested trees are limbed and topped where they fall in the woods to leave behind a continuous fuel bed.

Units are burned under specific conditions, as described in the burn plan, to accomplish stated objectives. Use of underburning, or underburning with other slash control techniques, may occur on harvest units with higher residual stocking levels to further reduce fuel loads and re-introduce fire into the ecosystem.

Sale Advertisement and Award

All contract sales and paid timber cutting permits will be advertised on the open market in compliance with Title 25, Code of Federal Regulations, Part 163.15. (Special Allotment Timber Harvest Permits are issued to the sole Indian owner and any advertisement and sale of authorized timber is the responsibility of the owner/permittee.) All advertisements over $15,000 in value will be advertised in the local newspaper (*East Oregonian* and *Confederated Umatilla Journal*) and a prospectus will be mailed to all local mills and timber operators listed on the current Agency mailing list. All advertisements shall be approved in advance by the Superintendent, Umatilla Agency. The advertisement will provide the basic information and instruction on submission of bids. For specifics of the sale, potential bidders should be referred to the approved form of contract as contained in the Forest Officer's Report. The advertisement should cover the following:

- Reservation and sale unit name, length of the contract, and acreage to be harvested.
- Type of bid to be received at the stated place, day, and time.
- Sale forest product volumes and species with a statement that the volumes are estimates and are not guaranteed.
- Minimum stumpage prices acceptable and the basis of scale.
- Stumpage price of material to be paid by flat rate, if any.
- Amount of deposit with bid and disposition of deposits.
- The amount of advance payment required by the contract.
- Amount of performance bond required with the contract.
- Amount of advance deposit required by the contract.
- Other requirements or special features in the bidding.
- Identify the source for further information concerning the sale and bid submission.
- State the date of the advertisement and the name and title of the officer authorizing the advertisement.

All advertised sales will be awarded through sealed bidding. Bids received through the mail will be held by the BIA mail clerk/authorized collector in the Agency vault until bid opening. Bids will be opened at the time and place designated in the advertisement. Bids and deposits will be examined and decisions made as to rejection of any bids because of inadequacy, improper deposit, etc. All acceptable bids will be announced, given a sequential bid number, and posted on the bid abstract and display board. The apparent high bidder will be announced upon opening of all bids. There will be no formal acceptance or rejection of bids at this time. Formal acceptance or rejection will be by the approving officer (Superintendent). The deposit of the apparent high bidder, and of others who submit a written request to have their bids considered for acceptance, will be retained pending acceptance or rejection of the bids. All other deposits will be returned following the opening and posting of bids. A Bill for Collection will be prepared through the TAAMS system for all bid deposits to be collected. The bid deposit and

Bill for Collection will be provided to the Office of Special Trustee (OST) authorized collector to be submitted to the Lock Box.

If a sale is not awarded after the appropriate advertisement period, the approving officer may, within one year from the last day on which bids were to be received, as defined in the advertisement, permit the sale of such forest products. The sale will be made upon the terms and conditions in the advertisement and at not less than the advertised value or the appraised value at the time of the sale, whichever is greater.

Record Keeping and Reporting

The Forest Officer's Report (FOR) represents the culmination of the sale preparation process. The FOR contains all of the relevant information pertaining to a particular sale, including a description of the area, cruise summaries, silvicultural prescriptions, marking and cruising guidelines, maps, access including road construction and maintenance needs, management plan sustained yield objectives, other land use values, reforestation and thinning needs, appraisal summary, consent of owners summary, advertisement and prospectus, and sample contract. FOR's are useful both during an active sale and as an historical reference.

FOR's are written only for contract sales, and are placed in the master timber sale file. This timber sale file contains a chronological record of all correspondence relating to the sale, the timber sale contract, Forest Officer's Report, sale area maps, crossing permits and rights-of-way, timber sale inspection reports, scale reports, financial records, Environmental Assessment, and FONSI.

Timber Sale Administration

Timber sale administration includes all phases of fieldwork, correspondence, and documentation required in the administration of an approved timber harvest. The level of documentation and specific administration procedures vary depending on the value of the sale and the property ownership. Most timber sale administration duties are performed by the Officer in Charge and the Timber Sale Officer (Timber Sale Administrator). The Officer in Charge is the forest officer of highest rank assigned to the supervision of forest work at the agency. The Timber Sale Officer represents the Officer in Charge, and is responsible to ensure that on-the-ground sale activities comply with the contract provisions.

On all contract sales and for larger permits, a logging plan should be prepared before the sale operations begin. Participants in plan development should include the purchaser and/or his designated on-site representative, the Officer in Charge, and the Timber Sale Officer. The purpose of a logging plan is to: (1) maintain a clear understanding by the purchaser of the performance required, and (2) to reduce contention in the day-to-day relations of the purchaser and the sale administrator. The plan should establish the operating season, general progression of sale activities, production rates, timeframes, equipment to be used, logging practices, load accountability, road development and maintenance, threatened/endangered species special requirements, Tribal restrictions and closures, woods organization, contact information, and delegations of authority. Logging plan updates may be required whenever major changes occur.

Sample logging plans and additional information are available in the Contract Sales of Forest Products Handbook.

Field Administration Procedures

The Timber Sale Officer (TSO) is responsible for ensuring that field operations meet the provisions of the timber sale contract and associated documents. Progress is monitored by regular visits to the sale. Reference documents used by the TSO include the timber sale contract, standard provisions, logging plan, FOR, temporary crossing permit, and rights-of-way.

The primary duty of the TSO is to establish a close working relationship with the logging crew, thereby minimizing potential problems and obtaining the best overall job possible. During active logging, the sale should be visited a minimum of two times per week. Each inspection shall be discussed on-site with the contractor's representative and documented in the inspection report. One copy of the inspection report is provided to the contractor's representative and one copy is maintained in the timber sale master file.

Log Control and Scaling

Movement of forest products requires specific accountability procedures for estimated volume sales. These procedures are established in the sale contract and the Officer in Charge must make certain that the procedures are in place to fully account for all products to be removed from a sale. Forest product accountability must maintain ownership identity from the time logs are severed from the stump until the volume or weight is correctly scaled and recorded for the originating ownership. Accountability is obtained when the wood is scaled in accordance with approved procedures.

Scaling is the determination of the gross and net volume of logs by the customary commercial units for the products involved. The National Forest Log Scaling Handbook, FSH-2409.11, will be used to provide standard instructions for volume determination. Any supplemental or special scaling provisions shall be clearly detailed in the sale contract.

On most logging units, the merchantable standard is that the log be at least 8 feet in length (with trim added) and at least 5.5 inches diameter inside bark (DIB) at the small end, with a scaling volume of at least 10 board feet. For a tree to be considered merchantable, it must contain at least two pieces that meet this minimum standard or yield a 16-foot log with a minimum 5.5 inch DIB at the small end. On logging units that have a sufficient volume of material that is not of merchantable size, but which can be removed by the purchaser economically, the logging unit provisions may allow or require that this material also be removed during logging operations. This material is usually scaled by weight measure.

The Officer in Charge of a sale has authority through the contract standard provisions (Part B7.2) to designate the point at which products shall be presented for scaling. Products shall not be moved from the designated scaling point until they have been scaled, stamped, numbered, or otherwise released by the Officer in Charge. All loads of un-scaled forest products removed

from trust lands must have a load ticket attached. Sample load tickets and recommended procedures are explained in more detail in the Contract Sales of Forest Products Handbook.

Due to the relatively small annual harvest volume, it is not reasonable to maintain qualified scalers on staff. Scaling of forest products will be by third party scale. Most scaling will be by independent Scaling Bureaus. These organizations have their own standards for certification and also conduct their own check scale of employees. The BIA will also conduct periodic check scale of the Scaling Bureau scalers. This service should be coordinated through the BIA Northwest Regional Office.

All local mills currently use the services of an independent Scaling Bureau. Each scaling organization must have a Third Party Scaling Agreement approved by their organization and the Approving Officer before trust forest products can be scaled. These Agreements specify the appropriate scale rules to be used in scaling trust forest products and the reporting requirements. Periodic checks will be carried out by the Officer in Charge to insure scale ticket accountability and the accuracy of scaling. The sale contract will specify that the timber purchasers pay for the services of the Scaling Bureau.

Financial Accounting System

Significant changes have recently been made to the process of handling monies from the sale of timber on trust lands. The BIA has transitioned to the Trust Asset Accounting Management System (TAAMS) for the processing of all trust funds. All funds generated from the sale of timber on trust lands must be processed through this system. Adequate Tribal Forestry staff will be required to obtain and maintain authorization to access the TAAMS program.

The purpose of TAAMS is to provide a comprehensive, integrated national trust information system for title and land resource management for use across the Department of the Interior that replaces duplicative and obsolete legacy systems. TAAMS is made up of a number of different modules that are used during the timber sale process. The Name and Address Module maintains current information on land owners, tribes, governmental agencies, and businesses. The Title Tract Module performs title functions including the production of land title documents, certifiable probate inventories, abstracts of title, and issuances of certified reports required for Indian title, including information on historical transactions. The Forestry Document Module allows entry of timber sale contract and permit data, recording of scale information, invoicing, and calculation of amounts to be distributed to landowners and the other forestry accounts. The Invoicing/Funds/Payments Module produces invoices and tracks movement of funds from the various timber accounts. The Reporting Module allows production of any number of reports that may be required for the development and documentation of the timber sale process. Other modules, not typically used by Forestry, cover mortgaging, oil and gas leasing, range permitting, surface and business leasing, and land consolidation

Closure of Timber Sales and Paid Permits

Upon the satisfactory completion of all harvest and post-harvest requirements of a timber sale or paid permit, the TSO will complete a thorough field inspection of the harvest area and prepare a

final inspection report. Scale and payment records are reconciled to insure that the purchaser has properly paid for all timber harvested from the sale area.

For timber sales, a Statement of Completion of Timber Contract (BIA Form 5-5319) is prepared and forwarded to both the Purchaser and the Superintendent for review and signature. This report summarizes the harvest volumes and values by species and product harvested on the sale. The Statement of Completion is not required on paid timber-cutting permits.

If a performance bond was required, any residual amount may be returned to the purchaser. Cash bonds held in Federal Finance System are released by a Public Voucher for Refunds (SF-1047) through the BIA. The authorized collector holding documents such as Letters of Credit and Assignment of Savings Account Agreements in lieu of cash bonds may return such documents to the purchaser by regular mail.

Upon the completion of these sale closure procedures and after all accounts associated with the sale are closed, a letter of closure is then mailed under the Superintendent's signature to the purchaser relieving them of any further liability associated with the timber sale. The purchaser is also mailed a copy of the final Statement of Completion of Timber Contract.

Record Keeping and Reporting

The completion of the sale closure procedures represents the culmination of the sale administration process. During the active life of the timber sale or paid permit, all correspondence, inspection reports, scale reports, financial accounting records, and other pertinent documents are routinely added to the master timber sale file. This file also contains all the pertinent documents generated during the sale preparation process. A copy of the Statement of Completion of Timber Contract should be added to each individual Allotment file when allotted lands are included in any harvest.

At the end of each fiscal year, an annual report and Report of Timber Cut are prepared for the Bureau of Indian Affairs. These reports summarize volumes and values for the timber harvested from trust land from timber sales, paid permits, and free-use permits.

Annual Allowable Cut and Harvest Schedule

Annual Allowable Cut

The annual allowable cut (AAC) is the quantity of timber scheduled to be removed in one year. Conclusions regarding an appropriate AAC are based primarily on outputs from an inland Pacific Northwest variant of the *Stand Projection System (SPS)* (Arney 1985a; Arney 1985b) and the *Spectrum* model (Greer and Meneghin 2000; U.S. Forest Service 2002). Appendix A contains detailed information regarding the use of *Spectrum* and *SPS*.

The average AAC over the 120 year modeling period is 3.24 MMBF/year (Table 4-1). Allotted and Tribal trust lands contribute 2.86 MMBF/year and Tribal fee lands 0.38 MMBF/year. Long-term sustained yield is 4.06 MMBF/year and is reached in decade 7. Timber management is applied to 14,765 total acres (Table 4-2). No scheduled harvest was applied to all floodplains and the inner 50 percent of all RMZ's. The CTUIR and BIA feel that, in order to comply with provisions of the Endangered Species Act of 1973 and the TMDL and WQMP of the CTUIR, vegetation treatment within the RMZ's must be limited to those treatments necessary to achieve water quality and instream fisheries habitat objectives. Approximately 2,434 acres of allotted trust, Tribal trust, and Tribal fee lands are within these categories.

Table 4-1. Annual Allowable Cut By Decade By Ownership.

	1	2	3	4	5	6	7	8	9	10	11	12
Allotment	0.65	0.87	0.84	0.97	1.06	1.19	1.19	1.33	1.19	1.28	1.60	1.46
Tribal Trust	0.73	0.78	1.00	1.24	1.60	1.99	2.38	2.24	2.38	2.29	1.97	2.11
Tribal Fee	0.16	0.20	0.24	0.28	0.34	0.41	0.49	0.49	0.49	0.49	0.49	0.49
Total	1.54	1.85	2.08	2.50	2.99	3.59	4.06	4.06	4.06	4.06	4.06	4.06

Note: AAC is in million board feet per year.

Table 4-2. Acres of Managed and Unmanaged Allotted Trust, Tribal Trust, And Tribal Fee Forest Lands.

Alternative	Allotted Trust	Tribal Trust	Tribal Fee	Total
Managed Acres	5,195	7,646	1,924	14,765
Unmanaged Acres	1,290	2,247	1,702	5,239
Riparian Zone	650	1,039	745	2,434
Other	640	1,208	957	2,805
Total Acres	6,485	9,893	3,626	20,004

The No Scheduled Harvest prescription was also applied to some acres where the current cost of logging exceeded the present value of the timber that could be harvested. Since no new roads can be built in the Isqúulktpe Creek and Big Johnson Creek Special Management Areas, some of the timber stands within these areas could only be treated with a helicopter logging system.

The AAC is described in terms of million board feet of sawtimber volume (MMBF). This figure is Scribner volume, 16' log scale, 8" minimum DBH, 4" minimum top, and 12' minimum log size. Additional volume can and will be removed in the form of pulpwood or firewood products, although no projections have been made. These volumes will be in addition to the sawtimber scheduled. Growth and yield projections assumed 10% for breakage and defect.

The AAC during the first and second decades is 1.54 MMBF and 1.85 MMBF, respectively. Timber harvest occurs on approximately 4,883 acres during the first decade and 4,554 acres

during the second decade (Table 4-3). The AAC is sustainable as the total inventory continues to increase during these decades. Data from the 2003 re-measurement of the CFI plots indicate that overall forest growth is approximately 173.16 board feet per acre per year, if the mortality associated with the western spruce budworm epidemic is not included. Utilizing this growth rate, the annual increment would be approximately 2.5 MMBF. A conservative approach to harvest in the first and second decades therefore gives the CTUIR and BIA the opportunity to validate modeling assumptions and to determine if goals and objectives are being met.

Table 4-3. Total Acres Harvest By Decade

Decade	1	2	3	4	5	6
Acres	4,883	4,554	6,970	6,770	7,086	6,795
Decade	7	8	9	10	11	12
Acres	7,410	6,875	7,670	7,078	4,883	4,554

Actual harvest levels under this plan may vary from year to year, and the total timber harvest during the planning period may be greater than or less than the projected harvest, depending on a number of factors.

- Barriers to meeting full AAC include: (1) difficulties in securing landowner consent for harvests on allotments, (2) poor markets for timber, and (3) program funding and staffing levels.
- Events that may increase harvest above the AAC include: (1) good markets for timber, (2) salvage opportunities, and (3) desire of landowners to harvest timber on their allotments.

Harvest Schedule

Spectrum produced the harvest schedule for the Forest Management Plan. The model results discussed herein are viewed as advice about how, where and when to apply silvicultural treatments to stands within the UIR in a cost efficient way that meets the objectives of this plan.

The IDT recognizes, however, that the modeling effort was based on broad scale data about the conditions of forest stands. Although the remainder of this section presents acres and volumes in what appear to be precise and absolute terms, the reader should understand that the IDT does not view the model results as hard-and-fast targets, floors, or ceilings on management activities. Rather, these are recommended levels of management activities, with estimated outputs and impacts. Both the activity levels and output levels will be revised as more site-specific data are incorporated into project-level planning.

The management regimes discussed in Chapter III are based on a 20-year re-entry cycle. Once a stand reaches a stocking level that can support a commercial harvest, it will be harvested every 20 years. As a result, nearly half of the acres available for harvest will be scheduled for harvest during this first ten-year period.

Priority should be given to stands as follows:

- Salvage of mortality
- Stands with imminent risk from insect and disease
- Stands with above average stocking
- Stands in Cool Moist zones with high levels of grand fir stocking
- Stands in Warm Dry zones with high levels of Douglas-fir or grand fir stocking

Planning timber sales on the UIR is made difficult by the land ownership patterns and the differing objectives and opinions of the various owners. A timber sale on allotted land or a sale that requires access across allotted land, for example, requires agreement from a majority of the ownership interests in each tract. As a result, sale design and scheduling is not a straightforward matter, and as a result, the Forest Management Plan does not attempt to delineate actual timber sale boundaries.

The following guidelines were developed to help prepare the harvest schedule. These guidelines assist in the creation of a regulated forest landscape, decreasing the cost of sale preparation and harvest, making sales more attractive to timber industry, and helping to obtain the maximum return to landowners:

- During the first decade, sales should be within ¼ mile of existing passable roads.
- Sales should be designed around common access routes.
- Larger sales, concentrated in one geographic area, are more efficient than smaller, scattered contracts and permits.
- Total sale volume should be harvestable in one season.
- Alternate sales between Tribal trust and allotted trust lands.
- Include management of Tribal fee lands when geographically convenient.
- When possible, prepare harvest at least one year in advance.

For these reasons, strict implementation of the AAC on an annual basis is not a reasonable objective. Forest treatments need to focus on stand needs rather than production of specific timber volumes. Actual volumes harvested for any given year can fluctuate from no commercial harvest to a maximum of approximately two year's AAC. However, treatments should provide for harvest within 20% of the targeted cut volume over a ten year period.

The proposed harvest schedule was developed using the above guidelines and suggests where to implement harvest treatment across the ownership (Table 4-4). Timber compartments from the 1982 Forest Management Plan were used to develop this schedule. These compartments were based on common access at that time. Access has changed in some areas over the past years and will require some modification of final cutting boundaries. Final sale design should follow the guidelines, as listed above, and treatment needs and priorities. Current local knowledge of stand conditions was used to help prioritize the scheduling sequence. This schedule can and should change as events require and more site-specific information becomes available.

The proposed schedule describes the general vicinity of the next five harvest treatments, which includes approximately 7 years of annual allowable cut. Total available acres listed is an estimate of the total forested acres which are suitable for ground skidding and within ¼ mile of a passable road. All available acres should be evaluated for treatment needs (both commercial and pre-commercial) during sale planning; however, the first entry will be delayed on acres that do not yet carry enough stocking to warrant harvest. Acres treated and the resulting harvest volumes for a given area may also change due to significant mortality events (fire or insects and disease), an inability to obtain required power-of-attorney, market conditions, and reductions for archeological and cultural resource protection. This schedule should be updated on a regular basis to maintain a 5-year sequential plan for AAC.

Table 4-4. Proposed Harvest Schedule

Compartment	Estimated Harvest Volume	Total Available Acres	Tribal Trust		Allotted Trust	
			MMBF	Acres	MMBF	Acres
8 Emigrant Springs (Tribal Lands Only)	2.9	522	2.9	522		
8 Emigrant Springs (Allotted Lands Only)	1.3	199			1.3	199
6 Isqúulktpe Creek (All Ownerships)	1.6	375	1.3	135	0.3	240
7 North Fork McKay (Allotted Lands)	3.4	544			3.4	544
10 Cold Springs (Tribal Lands)	1.3	563	1.3	563		
TOTAL	10.5	2,203	5.5	1220	5.0	983

Forest Development

Background

Forest development pertains to forest land management activities undertaken to improve the sustainable productivity of commercial Indian forest lands. Because certain forest development objectives may not be attainable through timber sale contract specifications or timber harvesting operations, achievement of these objectives may require additional silvicultural treatments and techniques. Included in this are all silvicultural treatments applied to establish, promote, enhance, and maintain optimum growth on selected trees to produce perpetual yields of desired forest products under the principles of sustained yield forest management.

The program shall consist of reforestation, timber stand improvement projects, and related investments to enhance productivity of commercial forest land with emphasis on accomplishing on-the-ground projects. Forest development funds will be used to re-establish, maintain, and/or improve growth of commercial timber species and control stocking levels on commercial forest land.

Funding

Current and past funding sources for the forest development program include:

- Special Forest Development Congressional add-on Funds (Non-Recurring Programs)
- Forest Management Deductions
- Timber Sale Special Project Deposits
- Cost Share Programs

Most funding sources listed above contain restrictions and/or special requirements for their use. Care must be exercised to ensure the correct source and use of funds for the various forest development projects.

Reforestation

Reforestation includes tree planting, replanting, and direct seeding, if necessary. Afforestation (planting trees where logging has not occurred or where timber previously did not exist) follows similar practices. Typical reforestation activities include:

- Stocking surveys and studies to determine the most feasible project sites, procedures, and methodology.
- Project field delineation.
- Site preparation (mechanical, fire, spot application of herbicides, hand scalping, slashing, or a combination of these techniques).
- Cone collection for seed acquisition.
- Production and acquisition of planting stock.
- Tree planting, replanting, or direct seeding.
- Protection of recently forested areas.
- Post-planting and contract compliance surveys.
- Limited access road repair.
- Project/program reporting, evaluation, records and maps.

Current regulations require that all harvest operations include provisions for natural and/or artificial reforestation of acceptable tree species in the harvest plan. If artificial regeneration is anticipated, special forest project funds may be collected during the timber sale. In some cases, forest management deductions will be adequate to cover artificial regeneration costs and will allow increased return to the landowner(s). Acres in need of reforestation as a result of timber sale activities are not recorded in the inventory of forest development needs unless the initial timber sale reforestation efforts fail.

Most anticipated harvest actions for the first decade will deal with severely overstocked stands where regeneration is not an objective. When regeneration harvests are applied, optimum and minimum stocking levels will be established in the harvest plan. When possible, use of natural regeneration is preferable due to the reduced cost and locally adapted seed source. However, cone crops can be irregular and hard to predict. Failures of natural or artificial regeneration

efforts may be eligible for addition to the reforestation backlog which can be funded through the special Congressional forest development add-on funds.

Timber Stand Improvement

Timber Stand Improvement (TSI) includes the silvicultural practices that enhance growth and yield of forest stands. Accepted TSI practices include:

- Planning, including stocking inventories and stocking studies, to determine the most feasible sites, procedures, and methodologies.
- Project field delineation.
- Pre-commercial thinning.
- Reduction of hazardous fuel generated by TSI operations.
- Release of desirable species.
- Protection of recently treated stands.
- Fertilization of commercial forest soils which support young, vigorous stands.
- Pruning of lower limbs on selected trees.
- Limited access road repair.
- Project/program reporting, evaluation, records and maps.

Forest Development Schedule

The IDT estimated forest development activities by ownership for the first decade based on *Spectrum* outputs, projects already identified as appropriate, and professional judgment (Table 4-5). Additional needs may be identified through stand exams and regeneration surveys upon implementation of the Forest Management Plan.

Table 4-5. Forest Development Activities For The First Decade By Ownership.

Ownership	Activity	Acres
Allotted Trust	Site Preparation	82
	Planting	82
	Pre-commercial Thinning	164
Tribal Trust	Site Preparation	250
	Planting	250
	Pre-commercial Thinning	265
Tribal Fee	Site Preparation	24
	Planting	24
	Pre-commercial Thinning	48
Total	Site Preparation	356
	Planting	356
	Pre-commercial Thinning	477

Record Keeping and Reporting

All forest development records will be maintained in a project file by year and project. Information to be kept includes silvicultural prescription, environmental review documentation, contracts, maps, and inspection records. This information is important for program accountability, stand history, and general information. For any projects conducted on allotted lands, a brief summary of the project should be included in the individual allotment folder.

The following annual reports of forest development activities are required by the BIA:

- Forest Development Planned Projects/Activities Report. This report indicates planned Forest Development projects for the upcoming fiscal year and estimates project expenditures and acres. This report is basically a request for Forest Development Congressional add-on funding. This report is due in the Northwest Regional Office (NWRO) by mid-October.
- Forest Development Projects Accomplishment Report. This report includes all reforestation and timber stand improvement accomplishments for the ending fiscal year and breaks out project expenditures and acres by funding source. This report is also due in the NWRO by mid-October.

These reports become part of the Northwest Regional Office report of accomplishments which is submitted to the Central Office. At the national level, this data is used to support future budgets. Copies of these reports should be submitted to the Agency Superintendent and the Regional Office by the requested due dates. Accomplishment and expenditure information should also be included in periodic reports to the Natural Resources Commission and the Board of Trustees.

Fire Management

Background

The Fire Management Program supports accomplishment of many of the goals and objectives of the Forest Management Plan. Components of the Fire Management Program include: Fire Prevention, Fire Preparedness/Readiness, Fire Suppression, and Hazardous Fuels Management. The overall program goal is to implement a program that is safe and cost efficient.

Federal wildland fire policy requires that every area with burnable vegetation must have a Fire Management Plan. The Fire Management Plan should be based on approved land management plans. However, in the absence of approved land management plans, a Fire Management Plan may stand alone. The primary purpose of the Fire Management Plan is to enable managers to make informed decisions on the appropriate management response to ignitions. In addition, the Fire Management Plan contains strategic and operational elements that describe how to manage response to unplanned ignitions, hazardous fuels and vegetation management, burned area emergency stabilization and rehabilitation, prevention, community interactions, and collaborative partnerships.

The Fire Management Plan for the UIR was developed and approved in 2000 (BIA 2000). As land management plans for the UIR are completed including this Forest Management Plan, the BIA and CTUIR will need to revise the Fire Management Plan, as necessary, to achieve the goals and objectives of the land management plans.

The Fire Program Analysis System (FPA) is slated to be the common interagency application for wildland fire planning and budgeting. The tool enables the USDA Forest Service and the USDI Bureau of Indian Affairs, Bureau of Land Management, U.S. Fish and Wildlife Service, and National Park Service to jointly plan fire management activities. FPA is supposed to encourage tribal, state, and local agency participation, incorporate geospatial data which provide the means to map effects of wildland fire on lands across the country, generate outcomes from fire planning units that provide information to the national budget planning process, provide a way for land managers to compare trade-offs between wildland fire program components, and function as a tool to ensure wildland fire management actions help meet performance measures.

The BIA Wildland Fire and Aviation Program Management and Operations Guide, revised annually, documents current policy and provides guidance to ensure safe, consistent, efficient, and effective wildland fire and aviation operations. The Annual Fire Operations Plan for the UIR is tiered to the Fire Management Plan and follows the policy and procedures in the BIA Wildland Fire and Aviation Program Management and Operations Guide.

Fire Prevention

The fire prevention function analyzes historical fire data in order to identify areas of the UIR with a high risk of human related ignitions. Efforts can then be made to reduce the risk of human related ignitions resulting in a reduction of the number of acres burned and a reduction in costs for suppression. Such efforts include presentations on wildfire awareness to local schools and through local newspapers or radio stations, erection of signs on fire danger levels along major travel routes, and public contact during patrols when risk of fire ignitions are high.

Fire Suppression Preparedness/Readiness

The Fire Preparedness/Readiness function involves the process of planning and implementing activities prior to wildland fire ignitions. This process includes actions which are completed on a routine basis prior to each fire season as well as incremental actions conducted in response to increasing wildland fire danger. Through contract, the Oregon Department of Forestry (ODF) is responsible for initial attack of wildland fires originating on allotted and Tribal trust lands within the Foothill and Upland Fire Management Units. ODF is also responsible for initial attack of wildland fires originating on fee lands within these Fire Management Units. ODF resources are stationed at the Pendleton, Oregon, Unit Office.

Suppression

All responses to wildfires are based on firefighter and public safety, cost effectiveness and values to be protected, consistent with resource management objectives. Due to the intermingled

pattern of land ownership (allotted trust, Tribal trust, Tribal fee, and other fee lands) all unplanned ignitions, both human related and natural are immediately subject to suppression actions.

The BIA must use the Wildland Fire Decision Support System (WFDSS) on any extended attack or large fire to evaluate alternative incident management strategies. The ODF Incident Management Team, if the fire is within their protection district, as well as the CTUIR must provide any required assistance to the BIA to complete this document. The approval of any incident management strategy remains the responsibility of the BIA.

The BIA and/or CTUIR have entered into several Local Operating Agreements and/or Cooperative Agreements that address fire suppression efforts on the UIR. The BIA and the U.S. Forest Service have entered into a Local Operating Agreement for the Pendleton Interagency Communication Center to provide BIA with extended wildland fire federal dispatch support. Beginning in 2010, this dispatch support is slated to be provided by the Northeast Oregon Interagency Dispatch Center in La Grande, Oregon. The BIA and ODF have entered into a Local Operating Agreement specifying that each entity will provide support to the other for suppression activities within the UIR, if resources are available. Finally, the BIA has entered into a Cooperative Agreement under the Indian Self-Determination and Education Assistance Act with the CTUIR that enables the BIA to use qualified Tribal personnel in fire management activities.

Hazardous Fuels Management and Prescribed Fire

Hazardous fuels reduction treatments are designed and implemented to reduce the risk and consequences of wildfire to communities, to restore and maintain healthy ecosystems, to promote the safety of firefighters and the public, and to meet other land management objectives. Fuel management activities may be used to reduce both naturally occurring fuels and fuel accumulations resulting from land management activities. Fuel management may involve either mechanical treatments or prescribed fire or a combination of the two to reduce ladder fuels and biomass.

A Wildland Urban Interface (WUI) exists where community defined values, structures, watersheds, roads and highways, gas and power lines, or other community resources intermingle with wildland fuels and may be threatened by wildfires. The Umatilla County Community Wildland Protection Plan, completed in 2005, was an interagency collaboration between ODF, BIA, CTUIR, the U.S. Forest Service, Umatilla County Soil and Water Conservation District, East Umatilla County Rural Fire Protection District, and Umatilla County as well as private stakeholders. The CWPP identified areas around Meacham Lake, Interstate 84, McKay Creek, and the Upper Umatilla River as being within a WUI.

Fuel treatment priorities are: (1) WUI areas and (2) other areas in Condition Class 2 or 3 in Fire Regimes I, II, III or those in Condition Class I where landscape conditions could quickly deteriorate to Condition Class 2 or 3. All requests for funding for planning and implementation of fuels projects must be done through the National Fire Plan Operations and Reporting System (NFPORS).

For each prescribed fire project, the BIA requires a written site-specific burn plan approved by the Superintendent. The purpose of the plan is to ensure that resource management objectives are clearly defined. A prescribed fire burn plan must include:

- A description of the burn unit and the primary reasons for the burn (site preparation, hazardous fuels reduction, etc.)
- The range of acceptable results expressed in quantifiable terms (reduction in loadings of specific fuel classes, etc.)
- The burning prescription which includes weather and fuel moisture criteria that will produce the desired results and the fire behavior that will enable the burning crew to maintain control.
- A description of how and when fuel moisture and weather conditions will be monitored to determine when they are within prescription.
- The location of fire breaks, hose lays, and other tasks required to prepare the site for burning.
- An assessment of the risk that the fire will escape along with the range of possible consequences.
- Provisions for notification of regulatory and cooperating agencies and the general public.
- Procedures and conditions for smoke management that will protect the health and interests of the public.
- Provisions for the safety and protection of fire sensitive features.
- Firing, mop-up, and patrol procedures.

In the development of prescribed burn objectives and the burn prescription, special attention must be given to the following guidelines to prevent soil damage and degradation of water and/or air quality.

1. Avoid consuming more of the litter and duff than necessary to meet burn objectives. This will protect the physical and nutrient properties of the soil.
2. Practice extreme care on steep slopes with highly erodible soils.
3. Limit the severity of the burn in and along intermittent streams.
4. Avoid smoke intrusion into smoke-sensitive areas.
5. Use the best available technology to reduce smoke taking into account other land management objectives. These best available technologies applicable to prescribed burning include, but are not limited to:

    a. Removing/Utilizing woody material;
    b. Rapid fire ignition;
    c. Rigorous mop-up;
    d. Burning only during optimal conditions.

Prescribed fire may also be used to enhance culturally significant plants. Prescribed fires conducted when the duff is relatively moist (spring), so that it is not completely consumed, result in heavy re-sprouting of big huckleberry rhizomes. Low-severity burning may also stimulate

bud growth, similar to pruning, and assist in the eradication of parasites. However, any burning that consumes large amounts of duff is harmful to big huckleberry regeneration (Simonin 2000).

Burned Area Rehabilitation

Disease and insects in forested vegetation that contribute to wildfires cause damage to the land and pose threats to fish, wildlife and people downstream. Some catastrophic events create situations that require special efforts to prevent further problems after the event. Loss of vegetation exposes soil to erosion; runoff may increase and cause flooding; sediments may move downstream and damage ecosystems and put endangered species and community water supplies at risk. The Burned Area Emergency Response (BAER) program addresses these situations with the goal of protecting life, property, water quality, and deteriorated ecosystems from further damage after the fire is out. Concern for possible post-fire effects on fish, wildlife, archeological sites, and endangered species is often a primary consideration in the development of a BAER plan.

BAER objectives are to:

1. Determine if an emergency condition exists after the fire.
2. Alleviate emergency conditions to help stabilize soil; control water, sediment, and debris movement; prevent impairment of ecosystems; and mitigate significant threats to health, safety, life, property, and downstream values at risk.
3. Monitor the implementation and effectiveness of emergency treatments.

BAER is 'first aid' - immediate stabilization that often begins even before a fire is fully contained. BAER does not seek to replace what is damaged by fire, but to reduce further damage due to the land being temporarily exposed in a fragile condition. In most cases, only a portion of the burned area is actually treated: severely burned areas; very steep slopes; places where water runoff will be excessive; and fragile slopes above homes, businesses, municipal water supplies, and other valuable facilities. Treatments are installed as soon as possible, generally before the next damaging storm. The spending authority granted for each BAER project covers only the most urgent treatments that cannot await normal funding processes. Special funds are authorized for these activities and costs vary with the severity of the fire season.

Professional hydrologists, soil scientists, engineers, biologists, silviculturalists, rangeland management specialists, and others who can evaluate the burned area and prescribe treatments to protect resources quickly and effectively staff BAER teams.

The BIA and CTUIR will comply with policies and procedures identified in the “Wildland Fire and Aviation Program Management and Operation Guide – Chapter 15 – Burned Area Emergency Response and Rehabilitation Program” on forested lands.

Rehabilitation after wildland fire or flood event is divided into two categories:

1. Damage from direct suppression actions.

2. Damage which resulted from the fire itself.

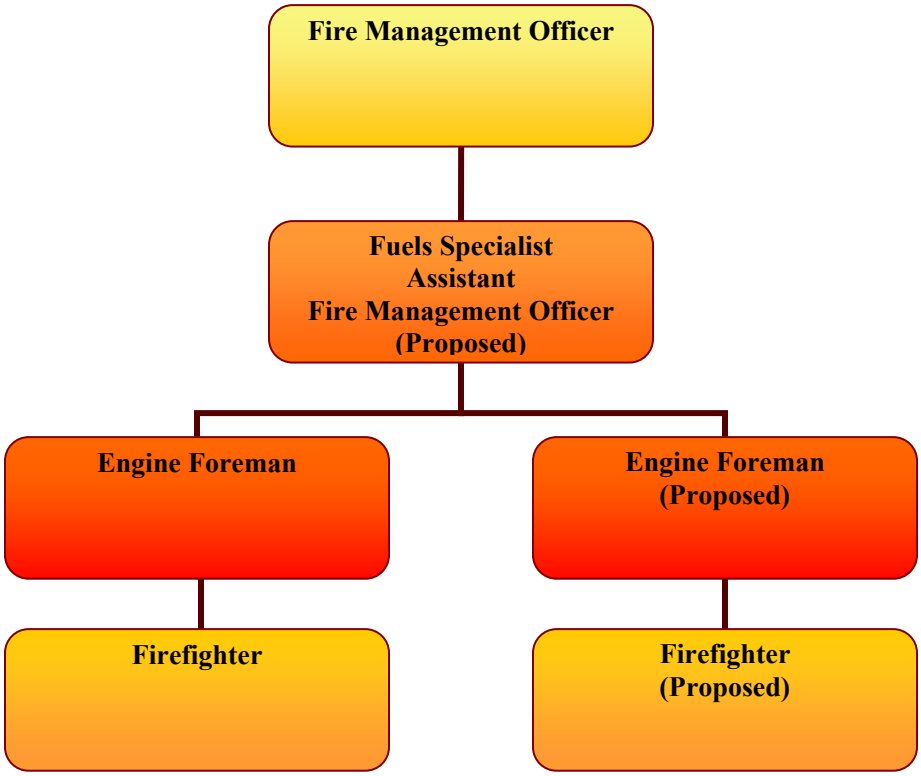
The rehabilitation plan, for example, for fire line construction is developed by the incident management team before transition of the fire back to the home agency. These actions are paid for by suppression funds.

The Burned Area Emergency Response plan addresses stabilization and rehabilitation of the land resulting from the fire. However, the fire itself must have an assessment done within seven days of the fire being declared "controlled". Funds are subject to congressional appropriations and are not guaranteed. Other funding from co-operative groups may be used to help stabilize land when BAER funding is not available.

Organization

The current fire management organization consists of a full-time Fire Management Officer and one engine crew (foreman and crew member) employed for six months. Through use of qualified personnel employed by the CTUIR, another engine crew is available most of the fire season. The BIA currently has one Type 6, Model 52, Engine and one Type 3, Model 52, Engine available. In order to fully implement the hazardous fuels management program, a full-time Fuels Specialist (Assistant Fire Management Officer) will be required along with another engine crew employed for six months (Figure 4-1).

Figure 4-1. Fire Management Organizational Chart



The Fire Program Analysis System is slated to be used in the future to determine the most cost efficient fire suppression organization. As conditions change and better information is developed the fire organization will likely need to be re-evaluated with this system.

Insects and Diseases

Background

Insects and diseases are a natural part of the forest environment on the Umatilla Reservation and an integral component of a healthy forest ecosystem. They serve a function in the forest ecosystem by thinning out trees, creating snags for birds, and providing down woody material for nutrient recycling. At times, individual trees or groups of trees can be subjected to increasing levels of stress from a variety of factors. Examples of factors which frequently pre-dispose trees to critical stress levels include extreme weather conditions, fire, overstocking, old age, mechanical injury, and poor genetics. Insects and diseases are very efficient in taking advantage of trees that are subjected to excessive levels of stress, which can result in the populations of insects and diseases expanding to epidemic levels. At epidemic levels, significant aesthetic, ecological, and economic damage may result.

In general, past management practices of selective harvesting and fire exclusion have encouraged many timber stands previously dominated by pine and larch to become stands dominated by shade-tolerant species (true firs and Douglas-fir). This altered successional pattern has resulted in an increase in incidence and severity of forest insect defoliators, bark beetles, and tree diseases. Insect and disease epidemics during the past 40 years have killed an un-naturally large number of trees, decreasing overall forest health and adding to the fuel load. There has also been an increase in bark beetle population in ponderosa pine stands due to unhealthy densities.

Next to catastrophic wildfires, forest insects cause the most visible and dramatic losses of conifers. Eight major insect pests have been identified, including the western spruce budworm (*Choristoneura occidentalis*), Douglas-fir tussock moth (*Orgyia pseudotsugata*), mountain pine beetle (*Dendroctonus ponderosae*), Douglas-fir beetle (*Dendroctonus pseudotsugae*), spruce beetle (*Dendroctonus rufipennis*), fir engraver (*Scolytus ventralis*), western pine beetle (*Dendroctonus brevicomis*), and pine engraver (*Ips pini*). The most serious insect problem is the western spruce budworm. This insect attacks Douglas-fir and the true firs. The mountain pine beetle periodically kills large numbers of ponderosa pine. The UIR has had a twenty-year history of repeated attacks by bark beetles and budworms. All of the forest types on the reservation have experienced significant mortality due to these insect epidemics.

Forest tree diseases also cause very serious losses that affect all resources. Forest diseases cause damage that is usually less visible, or appears to be less dramatic, than that caused by insect pests. Disease-caused losses occur over long periods of time, often over the entire life or rotation of a stand. Further, losses occur at relatively constant rates, although sometimes they increase during periods of environmental stress. Disease losses, while usually not as visible as defoliation or mortality that occurs during insect epidemics, over a rotation, may be comparable to, or even

exceed, insect caused impacts. This is often the case with diseases such as stem decay. Trees may have indicators such as wounds or fungus fruiting bodies, but until trees break, are windthrown, or are cut, losses associated with cull and defect are not realized. Disease losses may be gradual, such as with root diseases. As diseases progress, tree mortality occurs over a long period of time and only a small proportion of trees die each year. Sites become understocked and, therefore, less productive. Diseases may also result in growth loss. Dwarf mistletoe may have this effect for many years before finally causing mortality.

Major forest diseases on the UIR include a variety of root diseases, stem decays, and dwarf mistletoes. The maintenance of continuous closed stands without wildfire has also led to a well-established and geographically distributed dwarf mistletoe (*Arceuthobium spp.*) population. The parasite is most prevalent and destructive in Douglas-fir, western larch and ponderosa pine. These forest types are also characterized by many pockets of root rots which attack Douglas-fir, western larch, lodgepole pine and ponderosa pine. It is important to recognize that most pest caused damage and mortality is the result of pest complexes. Root diseases and bark beetles are closely associated. Root disease infected trees are weakened and frequently killed by beetles. Two or more different root diseases are often found together in centers of mortality.

Monitoring and Detection

Because outbreaks of insects and diseases are inevitable, early detection and response is essential. Detection of potential problem areas and potentially damaging populations of insects and diseases typically occurs through routine staff observations or the annual detection survey.

Incidental field observations made by Forestry personnel, in conjunction with their daily assignments, represent the most effective detection system. Field observations of damage should be reported promptly so that early evaluation of the situation can occur. An annual Cooperative Forest Insect and Disease Aerial Detection Survey is conducted by trained personnel from the USDA Forest Service and the Oregon Department of Forestry. Any insect and disease infestations which are visible from the air are mapped and labeled with the name of the damaging agent and the degree of severity. Digital maps of the survey are available through the USDA Forest Service Forest Health Protection web site (http://www.fs.fed.us/r6/nr/fid/as/). Prompt review of these maps and evaluation of potential problem areas is critical. It is important to understand that the aerial maps are relatively crude and actual damage may not be properly recorded. However, the locations are usually fairly accurate along with the type and severity of damage.

In 1988, the USDA Forest Service established a pest management field office in LaGrande, Oregon, to serve the Umatilla, Malheur, and Wallowa-Whitman National Forests, Baker City District of the BLM, and the Umatilla Indian Reservation. The office is currently staffed with two forest entomologists and one forest pathologist. The zone staff develops an annual work plan based on requests from the various agencies for assistance. They have provided services that include presentations to the Natural Resources Commission, general insect and disease evaluations of reservation lands, and site-specific evaluations/recommendations for specific problem areas. The Agency should request input from this office on any project driven by an insect or disease concern.

Control Strategies

Control of insect and disease problems will be accomplished through a combination of prevention and suppression. The primary prevention strategy for minimizing losses will be through silvicultural systems that control density levels and species composition. Timber sales and other treatment activities will be designed to promote tree vigor, favorable genetic characteristics, enhance natural resistance mechanisms, and develop stand structures and species compositions that maintain forest health. Application of integrated pest management through such treatments will reduce susceptibility or vulnerability to insects, diseases, parasites and other harmful agents.

The suppression strategy involves sanitation and salvage logging techniques which remove infected trees, or groups of trees. Silvicultural prescriptions will be developed based on the incidence of insects and diseases in a stand, the desired future condition, and the treatments necessary to meet the desired future condition. Individual trees, or groups of trees, which are infected with insects or diseases, or which are genetically inferior, will be marked for removal. In situations of wide-spread damage or epidemic outbreaks, sales or permits will be prepared specifically to address the threat of further damage and to capture the remaining value in the timber.

Invasive Species

Background

The occurrence and spread of invasive weeds is a major problem over vast areas of the Pacific Northwest including the UIR. The negative impacts of invasive weed infestations on natural biological diversity, ecosystem health, recreational values, and soil productivity are well documented. The increased economic and environmental costs for controlling invasive weeds transcend land uses and ownership.

Invasive weeds can infest new areas in a number of ways. Examples of invasive weed vectors may include, but are not limited to: (1) seed transport and dispersal along roadways from vehicles/equipment, (2) seed transport and dispersal from contaminated hay, (3) seed dispersal by domestic, feral, and wild grazers, (4) expansion of infestations from adjacent untreated lands, and (5) seed transport and dispersal from railcars. Sites in poor ecological condition are more susceptible to invasion. However, invasion of sites in good ecological condition is possible due to the extremely competitive nature of these exotic plant species.

Once invasive weed populations are established, they tend to expand at an exponential rate. These weed populations are free from the natural controls found in their native range. Invasive weeds negatively impact the environment in a number of ways:

1. Reduce biodiversity by out-competing native plant species.

2. Decrease palatable forage for wildlife and domestic livestock.

3. Diminish soil stability by overtaking native plants that have better soil holding characteristics.

4. Reduce land values by affecting forage quality and quantity.

5. Increase land management costs due to the need to control invasive weeds.

6. Affect the aesthetic value of the resource by displacing native species.

7. Increase risk to large mammals due to the toxicity of some invasive weeds.

Objectives:

- Reduce impacts from invasive species.
- Prevent the spread and establishment of invasive species into the forested environment.

Integrated Weed Management (IWM)

The BIA and CTUIR employ an IWM plan to reduce the impacts of noxious weeds on natural resources within the UIR. Implementation of this program occurs on all current and/or future noxious weed infestations involving both trust and fee lands within the boundaries of the UIR. Activities associated with this long-term management program include biological, chemical, and/or cultural control of the weeds coupled with restoration of the infestation sites.

IWM involves the use of all available control techniques in a well-planned, coordinated and organized program. Phases of IWM involve:

1. **Prevention**: Preventing the introduction of noxious weeds by the most practical and cost effective method.

2. **Site Analysis and Data Collection:** Determine what weeds are present, the area of infestation, the intensity of infestation, ecological site, and other site factors pertinent to successfully manage infested areas. Other applicable information may include mode of seed transport, important physiological characteristics, and past control methods. Systematically, field personnel can accomplish this with a standard site analysis form (*Noxious Weed Site Inventory*). It is also important to consider what is likely to happen with treatment method(s) and estimate what is likely to happen if the site is not treated.

3. **Select Strategy:** Once the data is collected and analyzed for a particular site, staff will then need to develop a strategy for conducting the weed control work. Simply stated, a "strategy" is the basic approach field personnel will take in managing all the vegetation to achieve the goals of a given site.

4. **Action:** This is the implementation step, including the on-the-ground work necessary to apply the management method(s). It may be appropriate to integrate a number of techniques into a site-specific management program. A contractor or an in-house certified applicator would complete the work. Oregon Department of Agriculture (ODA) and United States Environmental Protection Agency (EPA) standards would ensure that the treatment levels are conducted according to set standards.

5. **Monitor:** Monitoring will be established before, during, and after all phases of the fieldwork. Annual field checks will supply information on any new infestation and will support the early detection portion of this plan. In conjunction with Natural Resource Staff, other operating agencies on and off the reservation will be included in the early detection program to curtail any new weed infestations that may occur.

Prevention Strategies

- Ensure that weed prevention is considered in all pre-harvest timber projects.
- Include weed risk assessment in environmental analysis for timber harvest projects.
- Remove all mud, dirt, and plant parts from all off-road equipment before moving into a project area. Cleaning must occur prior to entering forest lands.
- Clean all equipment prior to leaving the project site if operating in areas infested with new invaders.
- Minimize the creation of sites suitable for weed establishment.
- Re-vegetate bare soil.
- Consider treating weeds on roads used by timber sale purchasers.
- Treat weeds on landings and skid trails that are weed infested before logging activities, where practical.
- Minimize soil disturbance while meeting harvest project objectives.
- Monitor for weeds after sale activity and treat weeds as indicated by local prescriptions.

Trespass

Trespass can include any damage due to human activity to forest resources on Indian forest land. Timber trespass is the removal of forest products, or damage to forest products, except when authorized by law and applicable federal and tribal regulations. Fire trespass is the act of willfully, or accidentally, setting of a fire without authority. Whether the trespass was intentional or unintentional, civil penalties apply and include treble stumpage values, costs associated with the repair of damage to land and/or resources, and costs associated with the enforcement of trespass regulations. Components of a program to address timber and fire trespass include: (1) prevention, (2) detection, (3) investigation, (4) appraisal of damages, (5) enforcement actions, and (6) collection of damages.

Procedures that will be implemented to prevent trespass include: (1) protection of property monuments, (2) clear, well-defined timber sale boundaries, (3) clear marking of trees designated

for cutting, (4) outreach efforts to inform the public, contractors, and landowners as to what constitutes trespass, and (5) periodic patrols to deter trespass. Maintenance of all property monuments should be a priority during any ground disturbing activity. All monuments and associated bearing trees should be protected during project development and implementation. Extra care must be observed where property lines are used as project boundaries. Property lines should be marked with red paint or flagging when they can be re-established between monumented corners. All sale units must have clear, well-defined boundaries. Boundary markers should be located facing into the unit close enough together so there is no question as to the location of the boundary. The mark on trees selected for cutting should be easily visible and on at least two sides of the bole. There should also be a good, wide stump mark that goes to ground level and is located on the downhill side of the bole that is protected from scuffing or abrasion during harvest operations. Contacts should be made with local citizens, allotment owners, businesses and contractors to explain what activities constitute trespass. Periodic patrols are effective in deterring potential trespassers.

All field staff are responsible to be alert to potential trespass situations. Special attention should be directed to logging operations on private land. Where activities occur adjacent to Indian lands, boundary markings should be inspected to be sure they are adequate. If the markings appear incorrect or inadequate, contact should be made with the adjacent landowners or operators. It is better to prevent or reduce the potential of trespass whenever possible.

The purpose of a trespass investigation is to determine who did it, what was done, how much damaged was incurred, from whom the damages can be recovered, disposition of the products and proceeds, and whether it can be proven in court. Each investigation should be prompt and complete with supporting documentation, including statements of witnesses, if any, and physical evidence. Photographs can be used to record evidence and may show things not noticed at the time of the initial investigation. All evidence found at the scene should be properly collected, recorded, and preserved.

Appraisal methods used to determine damages should be those normally used to establish the commercial value of the resource prior to sale on the open market. The methods, procedures, estimates and calculations used to determine volume and value of forest products must be applicable, used appropriately, and meet professional standards generally accepted by the forestry profession. Costs, other than stumpage, that can be charged to the trespasser include loss of value due to damage to trees; rehabilitation expenses; improvement, repair or replacement; and administrative, investigation, and enforcement expenses.

All trespass situations will be aggressively pursued to a satisfactory resolution. Procedures for reporting, determining value, demanding payment, and involving legal counsel for trespass onto trust lands are detailed in Title 25, Code of Federal Regulations, Part 163.29 and the Forest Trespass Handbook (53 IAM 7-H). The Superintendent, Umatilla Agency, has been delegated the authority to negotiate for, and accept, damage payments in full for trespass cases. Settlement for other than full value must be submitted to the Regional Office for approval. All trespass onto Tribal fee lands will be recorded and investigated. On trust lands, however, legal prosecution will comply with the appropriate Tribal laws. Information concerning these events should be submitted to CTUIR Department of Justice for resolution.

Tribal Codes and Permits

Water Code

Any person or entity who performs any activity that may alter stream flow, water quality, ground contours, or perennial vegetation, or that introduces or displaces debris in the Mid-Umatilla River, Wildhorse Creek, McKay Creek, and Tutuilla Creek Drainages as well as any intermittent or perennial stream, lake, pond, or any naturally occurring water body located in the G-1, Big Game Winter Grazing Zone or the F-2, Restricted Indian Forest Zone, as described in the Land Development Code, must obtain a Stream Zone Alteration Permit from the Water Resources Program of the DNR under provisions of Chapter 4 of the CTUIR Water Code.

Land Development Code

The Land Development Code of the CTUIR defines timber harvests as a conditional use in both the G-1, Big Game Winter Grazing Zone and the F-2, Restricted Indian Forest Zone. Conditional uses may be permitted by the Natural Resources Commission in accordance with the standards and procedures set forth in Chapter 6 of the Land Development Code. Consistent with the approved conditional use, the Tribal Planning Office can issue a Forest Practices Permit upon application, in accordance with provisions of the Forest Practices Manual, to conduct a timber harvest.

Resolution Number 04-071

Board of Trustees Resolution 04-071 adopted Guidelines for CTUIR Projects in the Case of Inadvertent Discovery of Ancestral Remains. The policy requires cultural resource reviews associated with all projects undertaken by, or on behalf of, the CTUIR.

> *"As a part of the site development process for any project undertaken by or on behalf of the CTUIR, as specified in Section II, the CTUIR shall ensure that an appropriate cultural resource review is conducted as a part of project planning to ensure, to the extent practicable, that cultural resource protection is integrated into project planning. Methods to be involved in this review shall include, but not be limited to, pedestrian surveys and site testing as recommended by CRPP."*

Tribal Employment Rights Code

Under the Tribal Employment Rights Office (TERO) Code, all employers engaged in business activities on the UIR are required to enter into a Compliance Agreement with the TERO. Compliance Agreements must be approved through the TERO before work can begin on any project and the TERO fees must be paid prior to the project start date. The Compliance Agreement is intended to set numerical goals for the employment of Indians and to identify the

skills required and the salary compensation terms for those jobs. Every employer with a contract of more than $10,000 must pay a compliance fee of 2.5 percent of the total amount of the contract.

Monitoring and Evaluation

This monitoring plan is an integral part of the Forest Management Plan. The monitoring plan provides the basis for:

- Annual reporting of compliance with goals, objectives, and standards
- Identifying the need for change
- Suggesting adaptive management strategies
- Capturing institutional knowledge about the UIR forest and how it can be successfully managed to meet multiple objectives

Types of Monitoring

Compliance monitoring

Certain monitoring activities are designed to determine whether management activities comply with this Forest Management Plan. This monitoring is conducted at two scales.

1. Forest level activity monitoring summarizes forest management activities on an annual basis:

- Harvest acres and volume
- Forest development activities
- Management costs
- Revenues
- Important changes to forest conditions (fire, new insect or disease infestations, etc.)

The objective of this effort is to determine whether actual management activities are within the range expected in the Forest Management Plan.

2. Sale level activity monitoring is a post-sale effort to determine whether all of the applicable standards and Best Management Practices (BMP's) were followed.

Effectiveness monitoring

Some monitoring activities are designed to evaluate key assumptions used in the planning process. Others may determine whether standards in the Forest Management Plan effectively create the desired conditions. Effectiveness monitoring is designed to answer the following questions:

1. Do the management activities create the desired conditions? Can the management activities be improved to be either more effective or less costly? Should other management activities be considered?

2. Are the Forest Management Plan standards effective in protecting key resources values? Can they be applied as written? Are other standards needed?

Monitoring Procedures

Annual forest-wide compliance reporting

The Program Manager for Forestry will prepare an annual report summarizing forest-wide compliance monitoring. The report will show sub-totals by ownership, where appropriate.

The report will include:

1. Acres and volume harvested compared to the annual averages projected in this Forest Management Plan. Running totals will compare actual harvest during the period to the totals for the period.

2. Forest development activities.

3. Road construction, reconstruction, maintenance, etc.

4. Revenues and other forest values (firewood, personal use timber, etc.).

5. Management costs (personnel, contracting, road costs, etc.).

6. A narrative summarizing any important changes to forest conditions including, but not limited to, fire, new insect or disease problems, timberland acquisitions/dispositions, etc.

7. Summary of sale level monitoring conducted during the year.

8. Recommendation for changes to the Forest Management Plan or its planned implementation.

Post-sale effectiveness monitoring

Each timber sale area will be visited one, five and ten years after completion of the sale. The post-sale monitoring will provide an in-depth review of the sale. The review will be more qualitative than quantitative, focusing primarily on evaluating whether the management activities and standards had the intended effect.

The Supervisory Forester will appoint a team to conduct the post-sale review; the team may include members of the IDT. The results of the review will be well documented, with an eye toward passing on-the-ground knowledge from one generation of foresters to the next. The report will address at least the following questions:

1. Were sale objectives met?
2. Were the standards followed? Did they have the intended effect?
3. Is the sale area turning out as expected?
4. What worked? What didn't work? What should be done differently next time?

Long-term effectiveness monitoring of key sustainability assumptions

Certain planning assumptions are key to the determination that this Forest Management Plan will provide sustainable outputs and conditions over time. More quantitative monitoring will help determine whether adjustments are needed for future planning efforts. Key sustainability assumptions include:

1. Reproduction

   The multi-cohort regimes are based on the assumption that partial cuts will be followed by new reproduction. Conceptually, this reproduction could be either natural regeneration or under-planting. Based on observations, it appears very likely that adequate natural regeneration will occur on most moist sites.

   Five to ten years after each partial cut, harvested stands should be surveyed for reproduction success. If reproduction is inadequate to ensure the success of the next cohort in any one stand, under-planting should be considered. If there is a pattern of inadequate regeneration, the timber management regimes should be re-evaluated.

2. Snag recruitment and snag persistence

   The multi-cohort regimes are designed to leave enough large green trees after harvest to fulfill the snag requirements specified in the plan. On some stands, it may take several decades, however, before the trees are large enough to meet the desired snag size.

   For planning purposes, it was assumed that if there are enough large green trees available after harvest, there will eventually be enough snags. Five to ten years after each partial cut, a snag survey should identify whether there are enough snags and whether they are persisting in the landscape long enough to meet the needs of snag-dependent species.

   If there are not enough snags, snags could be created from green leave trees. If snags do not persist, then the leave tree specifications should be re-evaluated.

3. Growth

   The harvest levels projected in this plan are sustainable, assuming that actual growth is close to the growth projected by the growth and yield model. Growth during the next ten-year period is expected to average just 178 bf/acre/year. Periodic re-measurements of the CFI plots will provide information about overall growth rates that can be compared to the growth projected in the model.

If monitoring shows that the key sustainability assumptions are not valid, then further action is required. Such action may include: (a) revising standards or management activities; (b) reconsideration of planning strategies; and/or (c) recalculation of harvest levels. Such changes may require clarification, amendment, or revision of this Forest Management Plan. Table 4-6 suggests a format for capturing the results of key assumption monitoring.

Table 4-6. Monitoring Metrics For Testing Key Assumptions In The Forest Management Plan.

Effects To Be Monitored	Monitoring Methods	Frequency	Expected Range	Trigger/Action
Natural Regeneration	Cruise	After 5 yrs.	>50% stocked	>50%, let grow <50%, inter-plant
Artificial Regeneration	Cruise	After 1 yr. After 3 yrs.	70% stocked 70% stocked	>70%, let grow <70%, inter-plant
Snags & Large Woody Debris	Cruise	After 5 yrs.	90% prescribed snags and logs present	10% of areas have less than 90% of prescribed snags and down logs present
Growth	CFI Plots	10-15 yrs	Growth projected in the model	Deviations likely to affect timber yields by more than 15%

Roles of BIA, CTUIR, and OST

The BIA, CTUIR, and OST (Office of Special Trustee) each have specifically defined roles in implementing the Forest Management Plan (Figure 4-2; Figure 4-3). The CTUIR will prepare and administer timber sale contracts, plan and implement other forest management activities such as pre-commercial thinning and reforestation, and conduct the monitoring program. The BIA will approve timber sale contracts, documents prepared to comply with NEPA, and fire suppression actions. OST will be responsible to monitor payments to individual landowners and the CTUIR from the sale of timber from trust lands to insure the accounting is complete and accurate.

Figures 4-2 and 4-3 demonstrate the roles of the CTUIR, BIA and OST for the implementation of forest management activities.

Figure 4-2. Roles of BIA, CTUIR, and OST Implementing Timber Sales

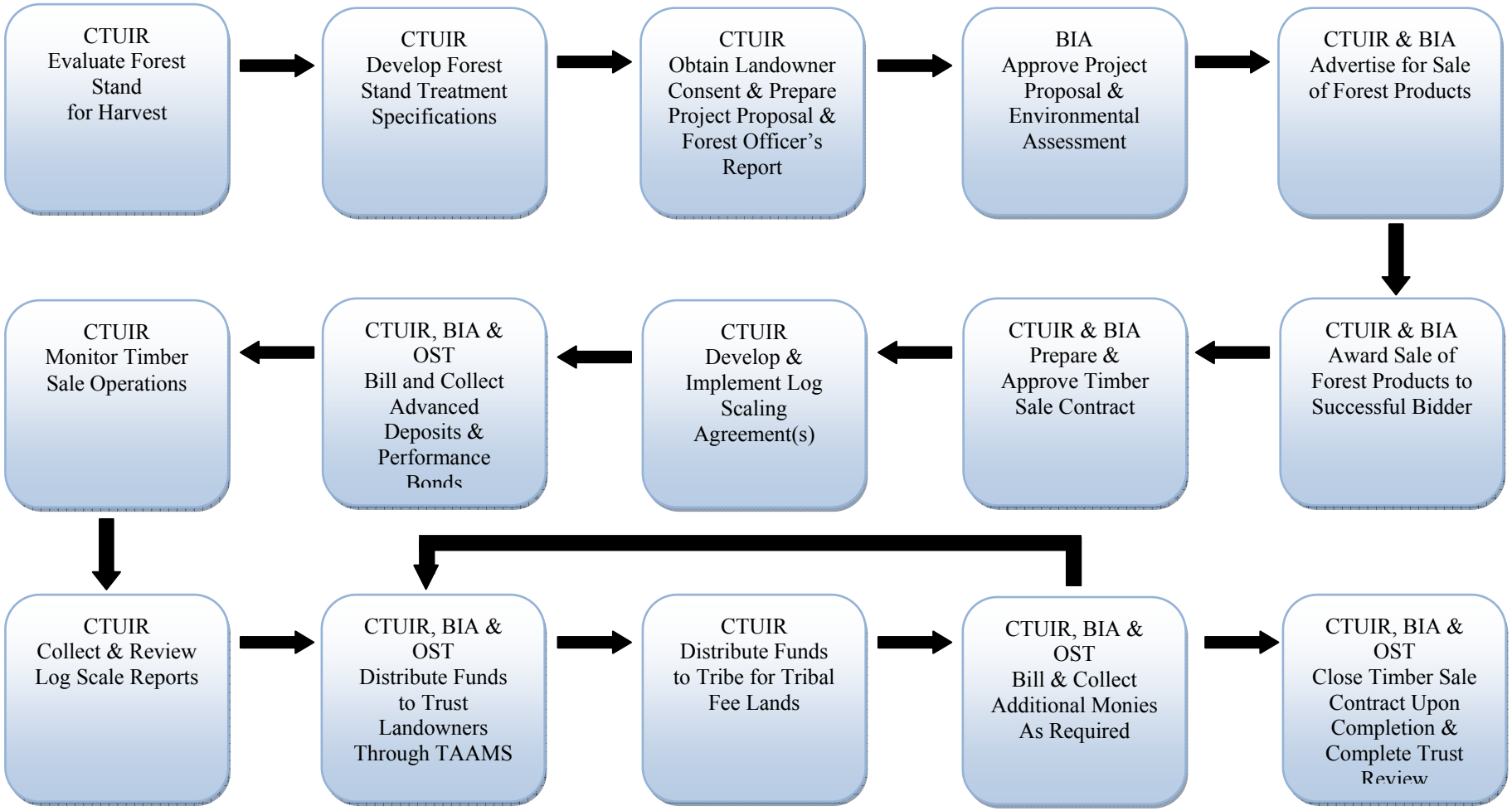
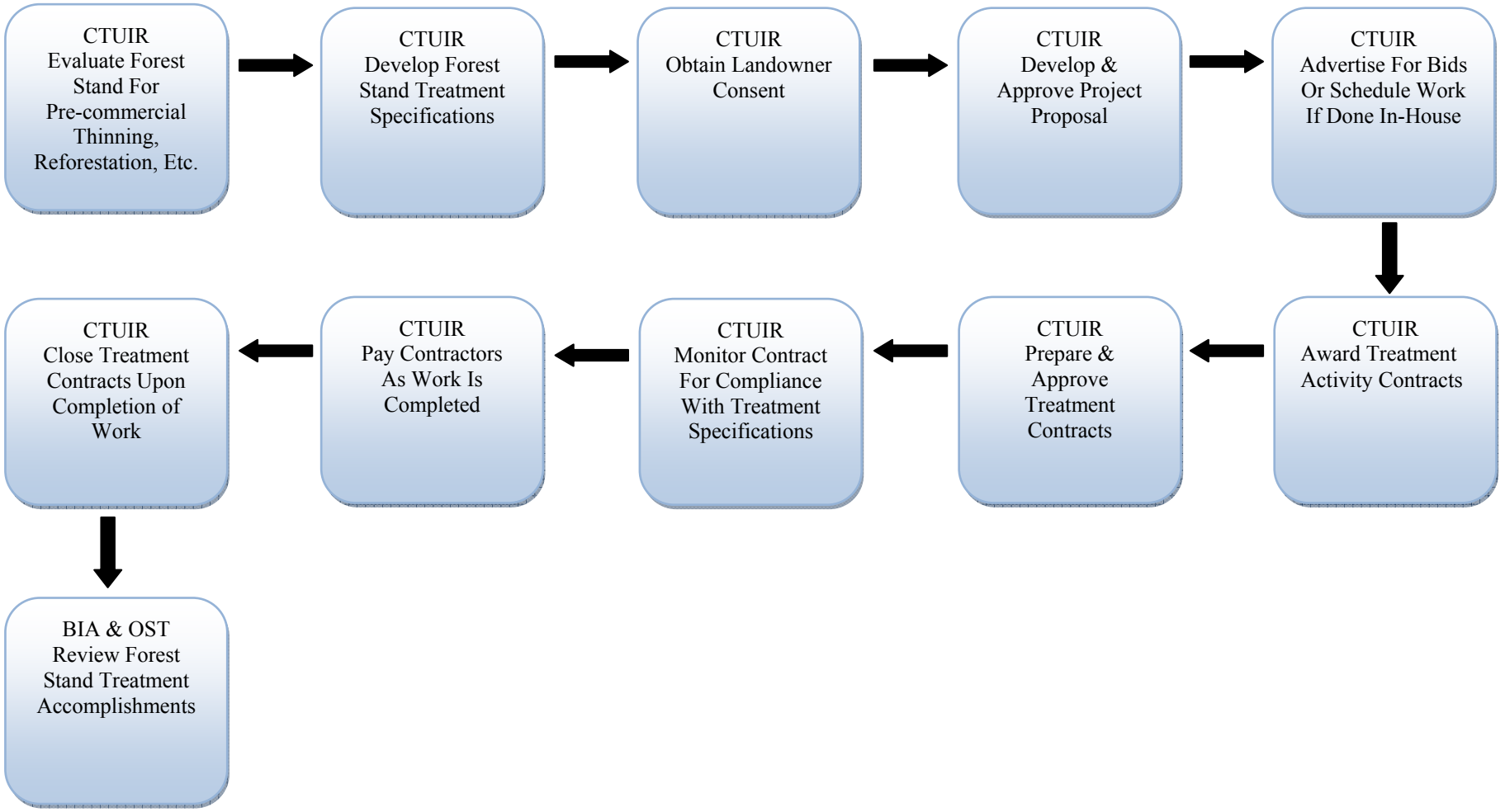


Figure 4-3. Roles of BIA, CTUIR, and OST Implementing Forest Management Activities Other Than Timber Sales



Organization and Funding

Land managers cannot achieve the goals and objectives contained in any natural resource management plan unless they have the financial resources necessary to implement the plan. Implementation includes monitoring the effectiveness of management activities in achieving goals and objectives.

The IDT assumed, at a minimum, that two foresters and two forestry technicians would be necessary to fully implement the vegetation management program. Other costs associated with implementing the vegetation treatment program include vehicles, office space and supplies, cultural resource surveys, and Forest Practices/Stream Zone Alteration Permits.

Since the Forest Management Program of the CTUIR will be responsible for more than just the vegetation treatment program associated with the Forest Management Plan, the IDT estimates a staff of five will more than likely be required. (Figure 4-4) (Table 4-7). These additional tasks include: timber cruises to establish an appraised value of forest lands involved in sales or exchanges; timber trespass investigations; and review of, or participation in, planning and implementation of activities involving other natural resource management programs.

Figure 4-4. Forest Management Organizational Chart

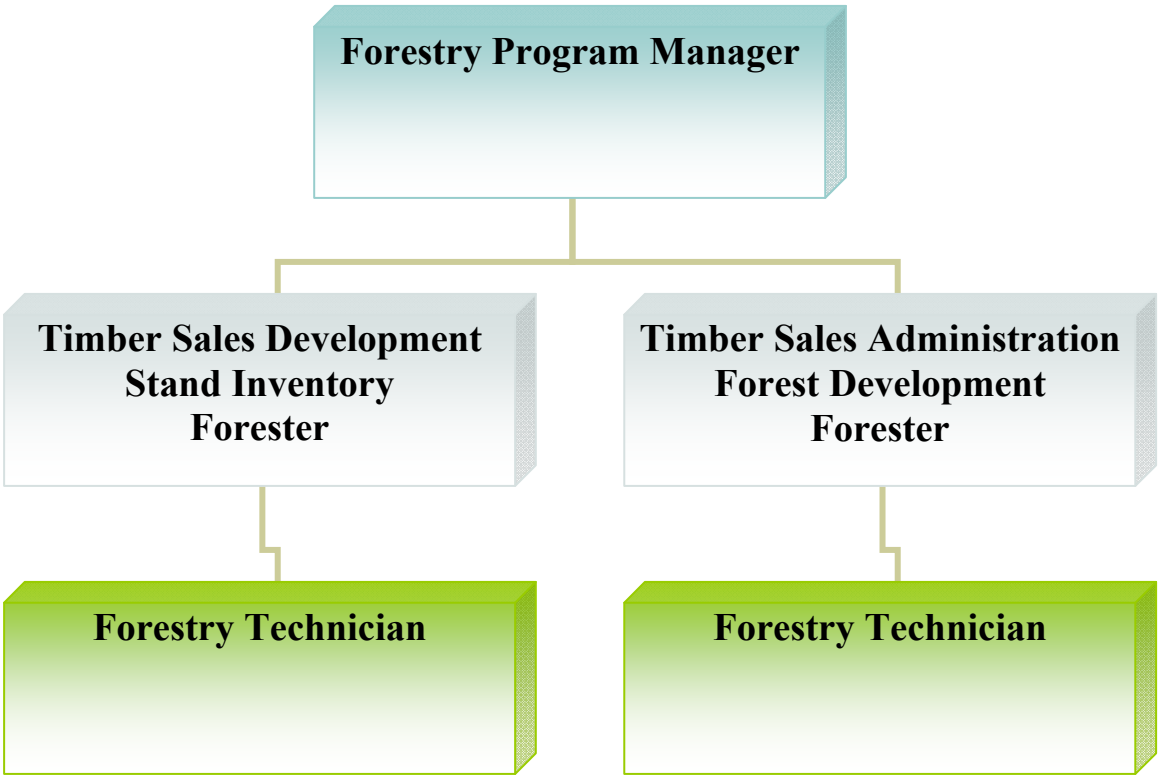


Table 4-7. Forest Management Program Costs

Position	Activity	Funding Required
Program Manager	Administration Inventory/Planning	$ 89,700
Forester Forestry Technician	Pre-Sale Realty Cruises Environmental Review	$ 69,000 $ 45,500
Forester Forestry Technician	Timber Sales Stand Inventory Forest Development	$ 69,000 $ 45,500
Other Costs	Vehicles, Travel Supplies/Equipment Permit Fees	$ 25,000
	Cultural Resource Surveys	$ 7,000
Total		$350,700

All positions and activities within the Forestry program are currently funded with Operation of Indian Program (OIP) funds compacted by the CTUIR from the BIA. OIP funding includes recurring Forestry program funds and non-recurring project funds for Forest Development (FD), Timber Harvest Initiative (THI), and Forest Management Inventory and Planning (FMI&P) activities. The FD, THI, and FMI&P funds are special funding sources which Congress authorized to help reduce the backlog of needs in those activities. Both the FD and THI funds are included in the Compact on a yearly basis. Funding for these activities has remained fairly steady over the past few years, with adjustments for increases and decreases to the total national budget authorization. FMI&P funds are included in the Compact for specific inventory and management projects such as aerial photography, timber type delineation, mapping and digitizing, CFI plot establishment and re-measurement, forest inventory analysis, forest management planning, forest management plan environmental assessment, and forest history.

Another source of funding for forest projects is the Forest Management Deduction (FMD) fund. An FMD of 10% is withheld from the gross proceeds of all sales of forest products harvested from Indian forest lands (Title 25 CFR Part 163.25). FMD's are not withheld from contracts or permits with a total value of less than $5,001. FMD's may be utilized to perform forest land management activities on trust lands in accordance with an expenditure plan prepared by the Tribe and approved by the Bureau.

Additional funding will be necessary to achieve full staffing to provide all program services and activities as described in this Forest Management Plan. One proposal to cover this shortfall is to dedicate a percent of Tribal timber sale proceeds for program funding. A disadvantage of this is that funding could be highly variable from year to year. Program funding would be highly

dependent upon the timber market. During low market demand, adequate funding may not be available to maintain full program staffing. In fact, it is reasonable to assume there will be times when market conditions are so poor that logging costs exceed mill prices. During such periods, management will be extremely challenging and the rate of plan implementation will likely be slowed.

Other possible sources of funds for specific forest management projects include the Environmental Quality Incentives Program (EQIP) and Wildlife Habitat Incentives Program (WHIP) of the Natural Resources Conservation Service (NRCS), the Conservation Reserve Enhancement Program (CREP) of the USDA Farm Service Agency (FSA), the Hazardous Fuels Reduction Program (HFR) and Wildland Urban Interface Program (WUI) of the BIA, the Partnership Performance Grant Program (PPG) of EPA, and the Fish and Wildlife Program through the Bonneville Power Administration (BPA) (Table 4-8).

Table 4-8. Forestry Management Activities and Potential Funding Sources

Forest Treatment Activity	Possible Funding Sources	Possible Funding Programs.
Pre-Commercial Thinning	NRCS, BIA	EQIP, WHIP, FD, FMD
Commercial Thinning	CTUIR, BIA	OIP
Prescribed Fire	CTUIR, BIA, USFS	HFR, WUI
Mastication	CTUIR, BIA, USFS	FD, EQIP, WHIP, FMD
Snag recruitment	BPA	Fish & Wildlife Program
Stand Exclusion	BPA, NRCS, EPA	Fish & Wildlife Program, EQIP, WHIP, PPG
Reforestation	NRCS, FSA, BPA, BIA, CTUIR, USFS, EPA	EQIP, WHIP, CREP, PPG, FD, FMD, Fish & Wildlife Program
Slash Treatment	NRCS, BIA, CTUIR, USFS	HFR, WUI, EQIP, WHIP, FMD, Fish & Wildlife Program
Tree Pruning	BIA, CTUIR, USFS, NRCS	HFR, WUI, EQIP, WHIP, FD, FMD

Chapter V - Economic Benefits

Introduction

For purposes of the Forest Management Plan, the market area for UIR timber is defined as Baker, Grant, Morrow, Umatilla, Union, Wallowa and Wheeler Counties in northeastern Oregon and Asotin, Columbia, Garfield and Walla Walla Counties in southeastern Washington. These counties contain the mills that one could reasonably expect to purchase UIR timber during normal market periods. The market area boundaries are dynamic, changing with the market. When log prices are high, logs can economically be hauled a longer distance. Conversely, when markets soften, economically feasible haul distances shrink.

The City of Pendleton is the recognized center of the forest products industry in Umatilla County. Easy access to rail transportation and the Columbia River facilitates exporting of finished lumber, logs, and wood chips.

The UIR market area includes five operating sawmills and one veneer mill. Many mills in this market area have closed during the last decade due to the substantial reductions in timber supply. Many of the surviving mills, however, have increased capacity through mill improvements. Although the productive capacity of UIR forest lands is not high, it has the capacity to provide a continuous and positive cash flow which could support maintenance and enhancement of a broad array of other natural resources found on the UIR.

General Benefits

The economic well-being and lifestyles of people and communities can be affected by products and services from the UIR. The availability of wood products, forage, quality water, wildlife, fish, and aesthetic opportunities provided from the UIR will affect economic activity and lifestyles in local communities. Use of resources can assist in creating jobs and income which influence social stability. The selected alternative increases commodity production when compared to the recent past. The effect of these increases would likely be less than 1% in terms of increased jobs and income within the entire market area. However, the value of the timber harvested represents significant income to the CTUIR and individual landowners.

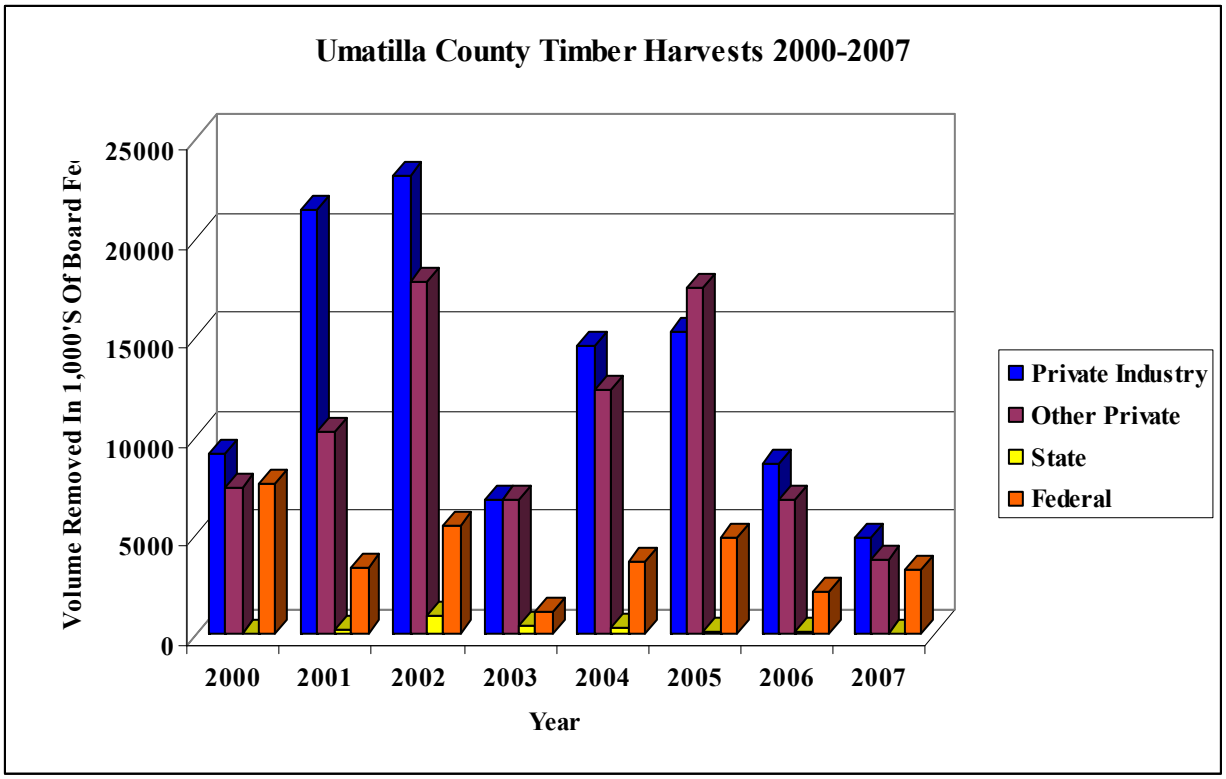
Net present value (NPV) is a measure of economic benefits and efficiency. For estimating the NPV associated with implementation of the Forest Management Plan, timber management costs and timber values over 120 years were discounted to the present using a 4 percent discount rate. NPV represents the discounted net revenue (total revenues minus total costs). The NPV of the selected management strategy over the 120 year planning period is $4,228,000. Net revenue is positive and increasing over time (Table 5-1). It must be kept in mind that economic analysis for the FMP was conducted using regional average timber management costs and values since recent historical UIR experienced costs and values were not available.

Table 5-1. Annual Undiscounted Revenue, Cost And Net Revenue By Decade.

Decade	1	2	3	4	5
Total Revenue	$ 707,700	$ 853,300	$ 960,900	$1,157,100	$1,408,700
Total Cost	$ 676,500	$ 741,000	$ 794,800	$ 986,400	$1,032,100
Net Revenue	$ 31,200	$ 112,300	$ 166,100	$ 170,700	$ 376,600

Timber harvest from private, state and federal lands within Umatilla County for the period 2000 through 2007 ranged from a low of 11.8 MMBF in 2007 to a high of 46.4 MMBF in 2003 (ODF 2008) (Figure 5-1). Implementation of the Forest Management Plan (AAC of 1.54 MMBF) would add a significant volume to the timber harvested within Umatilla County. These increases would have a positive net effect on the local communities in terms of jobs and income.

Figure 5-1. Timber Harvest In Umatilla County 2000-2007.



Indian-Related Benefits

The Tribe and Tribal members will receive revenues from timber sales as well as increased health and productivity of other resource values such as wildlife habitat and traditional foods/medicines. In order to fulfill the federal government's responsibility for management of

Indian trust resources, the BIA provides a significant portion of the costs of forest management. Using a conservative constant stumpage value of $150 per MBF, revenues to be distributed to the beneficial owners should increase by almost 95 percent over the next five decades (Table 5-2). Actual stumpage values should be somewhat higher if the regional and national housing markets recover from their currently depressed levels.

Table 5-2. Average Annual Revenue To Be Distributed To Landowners By Decade And Ownership.

Decade	1	2	3	4	5
Allotted Trust	$ 97,500	$ 130,500	$ 126,000	$ 145,500	$ 159,000
Tribal Trust	$ 109,500	$ 117,000	$ 150,000	$ 186,000	$ 240,000
Tribal Fee	$ 24,000	$ 30,000	$ 36,000	$ 42,000	$ 51,000
Total	$ 231,100	$ 277,500	$ 312,000	$ 373,500	$ 450,000

Further, pursuant to the Tribal Employment Rights Office (TERO) Code, all forest timber sale contracts awarded over $10,000 will be subject to a 2.5 percent Compliance Fee and be required to enter into a Compliance Agreement with the TERO. This Compliance Agreement is intended to set numerical goals for the employment of Indians, the skills required for those jobs, and the wage scales established by the TERO Program.

[This page left intentionally blank]

LITERATURE CITED

ACOE 1999. Upper Umatilla River Flood Study. US Army Corps of Engineers Portland District. Portland, OR.

Agee, J.K. 1990. The Historical Role of Fire in Pacific Northwest Forests. P. 25-38 *In* J.D. Walstad, S.R. Radosevich, and D.V. Sandberg (eds.). Natural and Prescribed Fire in Pacific Northwest Forests. Oregon State University Press. Corvallis, OR.

Agee, J.K. 1993. Fire Ecology of Pacific Northwest Forests. Island Press. Washington, D.C.

Altman, B. and A. Holmes. 2000a. Conservation Strategy for Landbirds in the Columbia Plateau of Eastern Oregon and Washington. Oregon-Washington Partners in Flight American Bird Conservancy Unpublished Report. The Plains, VI.

Altman, B. and A. Holmes. 2000b. Conservation strategy for Landbirds in the Northern Rocky Mountains of Eastern Oregon and Washington. Partners in Flight American Bird Conservancy Unpublished Report. The Plains, VI.

Anderson, M. D. 2003. Pinus contorta var. latifolia. In: Fire Effects Information System, [Online]. USDA Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: http://www.fs.fed.us/database/feis/ [Accessed 2008, November 10].

Arney, J.D. 1985a. A Modeling Strategy for the Growth Projection of Managed Stands. Canadian Journal of Forest Research 15:511-518.

Arney, J.D. 1985b. SPS Stand Projection System. Journal of Forestry. 83: 378.

Bell, J.H. 1988. Habitat Use, Movements, and Home Range of White-Tailed Deer in the Umatilla River Drainage, Northeast Oregon. M.S. Thesis, University of Idaho. Moscow, ID.

Buchanan, D., M. Hanson, and R. Hooton. 1997. Status of Oregon's Bull Trout: Distribution, Life History, Limiting Factors, Management Considerations, and Status. USDOE Bonneville Power Administration Technical Report DOE/BP-34342-5. Portland, OR.

Bull, E.L., C.G. Parks, and T.R. Torgersen. 1997. Trees and Logs Important to Wildlife In the Interior Columbia River Basin. USDA Forest Service Pacific Northwest Research Station General Technical Report PNW-GTR-391. Portland, OR.

BIA. 2000. Fire Management Plan and Environmental Assessment Umatilla Indian Reservation. USDI Bureau of Indian Affairs Umatilla Agency Pendleton (Mission), OR.

BIA. 2003. Continuous Forest Inventory Manual. USDI Bureau of Indian Affairs Umatilla Agency Pendleton (Mission), OR.

Bureau of Reclamation. 1988. Umatilla Basin Project Oregon Planning Report Final Environmental Statement. USDI Bureau of Reclamation Pacific Northwest Region. Boise, ID.

Christensen, Glenn A., Paul Dunham, David C. Powell, and Bruce Hiserote. 2007. Forest Resources of the Umatilla National Forest. USDA Forest Service Pacific Northwest Research Station Resource Bulletin PNW-RB-253. Portland, OR.

Close, D A., M. Fitzpatrick, H. Li, B. Parker, D. Hatch, and G. James. 1995. Status Report of the Pacific lamprey (*Lampetra tridentata*) in the Columbia River Basin. USDOE Bonneville Power Administration Technical Report DOE/BP-39067-1, Portland, OR.

Close, D.A. 2000. Pacific Lamprey Research and Restoration 1998 Annual Report. USDOE Bonneville Power Administration Report DOE/BP 00000248-1. Portland, OR.

Cochran, P. J. Geist, D. Clemens, R. Clausnitzer, and D. Powell. 1994. Suggested Stocking Levels for Forest Stands in Northeastern Oregon and Southeastern Washington. USDA Forest Service Pacific Northwest Research Station Research Note PNW-RN-513. Portland, OR.

Contor, C., E. Hoverson, P. Kissner, and J. Volkman. 1996. Umatilla Basin Natural Production Monitoring and Evaluation Annual Progress Report 1994-1995. USDOE Bonneville Power Administration Technical Report DOE/BP-75349-2. Portland, OR.

Contor, C.R. 2004. Umatilla Basin Natural Production Monitoring and Evaluation 1998-2002. USDOE Bonneville Power Administration Summary Report DOE/BP-00004115-1. Portland, OR.

Csuti, Blair, A. Jon Kimerling, Thomas A. O'Neil, Margaret M. Shaughnessy, Eleanor P. Gaines, and Manuela Huso. 1997. Atlas of Oregon Wildlife: Distribution, Habitat, and Natural History. Oregon State University Press. Corvallis, OR.

CTUIR and ODFW. 1990. Salmon and Steelhead Production Plan Umatilla River Subbasin. Northwest Power and Conservation Council Columbia Basin System Planning. Portland, OR.

CTUIR. 1997. Umatilla River Basin Wetland Protection Plan: Minthorn Springs, Umatilla Indian Reservation. Confederated Tribes of the Umatilla Indian Reservation, Department of Natural Resources. Pendleton (Mission), OR.

CTUIR. 2005. Confederated Tribes of the Umatilla Indian Reservation Total Maximum Daily Load for Temperature and Turbidity. Confederated Tribes of the Umatilla Indian Reservation, Department of Natural Resources. Pendleton (Mission), OR.

CTUIR 2006. Coyote Business Park Final Environmental Impact Statement. USDI Bureau of Indian Affairs. Pendleton, OR.

CTUIR. 2008. Water Quality Management Plan. Confederated Tribes of the Umatilla Indian Reservation, Department of Natural Resources. Pendleton (Mission), OR.

Fairweather, S.E. 2009. Final 2003 Forest Inventory and Analysis Report for the Confederated Tribes of the Umatilla Indian Reservation. Mason, Bruce, and Girard, Inc. Portland, OR.

Gilligan, J., D. Rogers, M. Smith, and A. Contreras. 1994. Birds of Oregon: Status and Distribution. Cinclus Publications. McMinnville, OR.

Gabrielson, I and S. Jewett. 1940. Birds of Oregon. Oregon State Studies In Zoology Monograph No. 2. Oregon State College. Corvallis, OR.

Gonthier, J.B. and D.D. Harris. 1977. Water Resources of the Umatilla Indian Reservation. USDI U.S. Geological Survey Water Resources Investigations Report 77-3. Portland, OR.

Greer, K. and B. Meneghin 2000. SPECTRUM: An Analytical Tool for Building Natural Resource Management Models. p. 376-384. *In*: J. Fried, M. Vasiewvich and L. Leefers (ed.) Proceedings of the Seventh Symposium on Systems Analysis in Forest Resources. USDA Forest Service North Central Research Station General Technical Report NC-205.

Haberstroh, T. 2009. Personal Communication. Forester, Department of Natural Resources at the Confederated Tribes of the Umatilla Indian Reservation. January 14, 2009.

Hall, F.C. 1976. Fire and Vegetation In The Blue Mountains: Implications For Land Managers. P. 55-170. *In*: Proceedings, 1974 Annual Tall Timbers Fire Ecology Conference. Published by the Tall Timbers Research Station.

Hunn, E. and J. Selam. 1989 Nch'i-Wana "The Big River" Mid Columbia Indians and Their Land. University of Washington Press. Seattle, WA.

Jackson, A.D, D.R. Hatch, B.L. Porter, D.A. Close, M.S. Fitzpatrick, and H. Li. 1997. Pacific Lamprey Research and Restoration 1997 Annual Report. USDOE Bonneville Power Administration Report DOE/BP 39067-3. Portland, OR.

Johnson, C. G. and R. R. Clausnitzer. 1992. Plant Associations of the Blue and Ochoco Mountains. USDA Forest Service Pacific Northwest Region Technical Publication R6-ERW-TP-036-92. Portland, OR.

Johnson, C.G. 1994. Forest Health in the Blue Mountains: A Plant Ecologist's Perspective on Ecosystem Processes and Biological Diversity. USDA Forest Service Pacific Northwest Research Station Gen. Tech. Rep. PNW-GTR-339. Portland, OR.

Johnson, C.G., R.R. Clausnitzer, PJ. Mehringer, and C.D. Oliver. 1994. Biotic and Abiotic Processes of Eastside Ecosystems: The Effects of Management on Plant Community Ecology, and on Stand and Landscape Vegetation Dynamics. USDA Forest Service Pacific Northwest Research Station Gen. Tech. Rep. PNW-GTR-322. Portland, OR.

Johnson, D.R. and A. J. Makinson. 1988. Soil Survey of Umatilla County, Oregon. USDA Soil Conservation Service. Portland, OR.

Keane, R.E., T. Frescino, M.C. Reeves, and J.L. Long. 2002. p. 367-396. *In* M.C. Rollins and C.K. Frame (eds.). The Landfire Prototype Project: Nationally Consistent and Locally Relevant Geospatial Data for Wildland Fire Management. USDA Forest Service Rock Mountain Research Station General Technical Report RM-GTR-175. Fort Collins, CO.

Kirsch, M. 2008. Personal Communication. District Wildlife Biologist. Oregon Department of Fish and Wildlife. December 5, 2009.

Knapp, S. R. Carmichael, D. Ehlers, S. Focher, T. Jones, and J. Kern. 2000. Evaluation of Juvenile Outmigration and Survival in the Lower Umatilla River Basin Annual Report 1998. USDOE Bonneville Power Administration Report DOE/BP-01385-10.

Lyman, R. 1984. A Model of Large Freshwater Clam Exploitation in the Prehistoric Southern Plateau Culture Area. Northwest Anthropological Notes. 18:97-107.

Lane, R.B. and B. Lane 1979. Traditional Fisheries of the Walla Walla, Cayuse, and Umatilla. Unpublished Report Confederated Tribes of the Umatilla Indian Reservation. Pendleton, OR.

Marshall, D.B., M. Chilcote, and H. Weeks. 1996. Species at Risk: Sensitive Threatened, and Endangered Vertebrates of Oregon. Oregon Department of Fish and Wildlife. Portland, OR.

McKelvey, K.S., K.B. Aubry, James K. Agee, Steven W. Buskirk, L.F. Rugiero, and Gary M. Koehler. 2000. Lynx Conservation in an Ecosystem Management Context. *In* L. F. Rueggiero , K.B. Aubry, S.W. Buskirk [and others] tech eds. Ecology and Conservation of Lynx in the United States. University of Colorado Press and USDA Forest Service Rock Mountain Research Station Gen Tech. Rep. RMRS-30WWW.

Northwest Power and Conservation Council. 2005. Umatilla River/Willow Creek Subbasin Plan. In Columbia River Basin Fish and Wildlife Program. Portland, OR.

ODEQ. 2001. Umatilla River Basin Total Daily Maximum Load (TMDL) and Water Quality Management Plan (WQMP). Oregon Department of Environmental Quality. Portland, OR.

ODF. 2008. Timber Harvest Report – Eastern Oregon. Oregon Department of Forestry. Available: http://www.oregon.gov/ODF/STATE_FORESTS/FRP/annual_reports.shtml [2008, November 26].

ODFW 1986. A Comprehensive Plan for Rehabilitation of Anadromous Fish Stocks in the Umatilla River Basin. USDOE Bonneville Power Administration Final Report Contract No. DE-AI79-84BP18008. Portland, OR.

ODFW. 2005. 2005 Oregon Native Fish Status Report. Oregon Department of Fish and Wildlife. Portland, OR.

Post, R. 1938. The Subsistence Quest. p 11-34. *In* L. Spier ed. The Sinkaietk or Southern Okanogan of Washington. George Banta Publishing Co. Menasha, WI.

Powell, D.C. 1999. Suggested Stocking Levels for Forest Stands in Northeastern Oregon and Southeastern Washington: An Implementation Guide for the Umatilla National Forest. USDA Forest Service Umatilla National Forest Technical Publication F14-SO-TP-03-99. Pendleton, OR.

Powell, D.C., C.G. Johnson Jr., E.A. Crowe, A. Wells, and D.K. Swanson. 2007. Potential Vegetation Hierarchy for the Blue Mountains of Northeastern Oregon, Southeastern Washington, and West-Central Idaho. USDA Forest Service Pacific Northwest Research Station General Technical Report PNW-GTR-709. Portland, OR.

Prichard, S.J., R.D. Ottmar, and G.K. Anderson. 2005. Consume 3.0 User's Guide. USDA Forest Service Pacific Northwest Research Station (Producer). Available: http://www.fs.fed.us/pnw/pubs/pnw_gtr690.pdf [2009, January 21].

Pyle, P., D.R. O'Grady, and D.F. DeSante. 1999. The 1998 Annual Report of the Monitoring Avian Productivity and Survivorship (MAPS) Program in Region Six of the USDA Forest Service. The Institute for Bird Populations. Point Reyes Station, CA.

Quigley, T.M. and S.J. Arbelbide, tech. eds. 1997. An Assessment of Ecosystem Components in the Interior Columbia Basin and Portions of the Klamath and Great Basins. 4 Vols. USDA Forest Service Pacific Northwest Research Station Gen Tech. Rep. PNW-GTR-405. Portland, OR.

Quigley, T.M., K.M. Lee, and S.J. Arbelbide. 1997. Evaluation of the Environmental Impact Statement Alternatives by the Science Integration Team. 2 Vols. USDA Forest Service Pacific Northwest Research Station Gen. Tech. Rep. PNW-GTR-406. Portland, OR.

Ray, V. 1933. The Sanpoil and Nespelm: Salishan Peoples of Northeastern Washington. Publications in Anthropology Vol. 5. University of Washington. Seattle, WA.

Ruediger, B., J. Claar, S. Gniadek, B. Holt, L. Lewis. S. Mighton, B. Naney, G. Patton, T. Rinaldi, J. Trick, A. Vandehet, F. Wahl, N. Warren, D. Wenger and A. Williamson. 2000. Canada Lynx Conservation Assessment and Strategy. USDA Forest Service, USDI Fish and Wildlife Service, Bureau of Land Management, and National Park Service, Missoula, MT.

Ruggiero, L. F., K.B. Aubry, S.W. Buskirk, [and others]. 1999. Ecology and Conservation of Lynx in the United States. University of Colorado Press and USDA Forest Service Rocky Mountain Research Station Gen. Tech. Rep. RMRS-GTR-30WWW. Niwot, CO.

Samallow, P.B. 1980. Selective mortality and reproduction in a natural population of Bufo boreas. Evolution. 34(1):18-39.

Scheeler, C., 2008. Personal Communication. Wildlife Management Program Manager, Department of Natural Resources at the Confederated Tribes of the Umatilla Indian Reservation. November 12, 2008.

Schonberger, C.F. 1945. Food of Some Amphibians and Reptiles of Oregon and Washington. Copeia 1945:120–121.

Shelford, V.E. and H.C. Hanson, 1947. The Problem of Our Grasslands. P. 139-148. *In* A.E. Parks and J.R. Whitaker. (eds.). Our Natural Resources and Their Conservation. James Wiley and Sons, Inc. New York, NY.

Simonin, K.A. 2000. Vaccinium membranaceum. In: Fire Effects Information System, [Online] USDA Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: http://www.fs.fed.us/database/feis/ [2009, January 16].

Smith, J. 1973. The Fish and Wildlife Resources of the Umatilla Basin, Oregon and Their Water Use Requirements (Revised). Oregon State Game Commission Federal Aid to Fish Project F-69-R-1 Job No. 13 Report. Portland, OR/

Smits, A.W. 1984. Activity Patterns And Thermal Biology Of The Toad *Bufo boreas halophilus.* Copeia 1984:689–696.

Spinden, H.J. 1908. The Nez Perce Indians. Memoirs of the American Anthropological Association. 2(3): 167-274.

Strahler, A.N. 1964. Geology Part II Quantitative Geomorphology of Drainage Basins and Channel Networks. p. 4-39 to 4-76. *In* V.T. Chow (ed.) Handbook of Applied Hydrology. McGraw-Hill. New York, NY.

Stinson, D. 2001. Lynx Recovery Plan. Washington Department of Fish and Wildlife. Olympia, WA.

Swindell, E.G. 1942. Report on Source, Nature, and Extent of the Fishing, Hunting and Miscellaneous Related Rights of Certain Indian Tribes in Washington and Oregon Together With Affidavits Showing Locations of a Number of Usual and Accustomed Fishing Grounds and Stations. Office of Indian Affairs, Division of Forestry and Grazing. Los Angeles, CA.

Thomas, J.W. tech. ed. 1979. Wildlife Habitats in Managed Forests in the Blue Mountains of Oregon and Washington. USDA Forest Service Agricultural Handbook No. 553. Washington, D.C.

U.S. Fish and Wildlife Service. 1998. Endangered Species Act Consultation Handbook: Procedures for Conducting Section 7 Consultations and Conferences. USDI U.S. Fish and Wildlife Service. Washington D.C.

U.S. Fish and Wildlife Service. 2004. Chapter 11, Umatilla-Walla Walla Recovery Unit, Oregon and Washington. In Bull Trout (*Salvelinus confluentus*) Draft Recovery Plan. U.S. Fish and Wildlife Service Pacific Northwest Region. Portland, OR.

U.S. Forest Service. 1990. Final Environmental Impact Statement Land and Resource Management Plan Umatilla National Forest. USDA Forest Service Pacific Northwest Region. Pendleton, OR.

U.S. Forest Service. 2001. Umatilla and Meacham Ecosystem Analysis. USDA Forest Service Pacific Northwest Region Umatilla National Forest. Pendleton, OR.

U.S. Forest Service. 2002. SPECTRUM Overview. USDA Forest Service Inventory and Monitoring Institute. Available: http://www.fs.fed.us/institute/planning_center/files/Spectrum26_Overview.pdf [2009, January 21].

U.S. Forest Service. 2009. Introduction to FASTRACS. USDA Forest Service, Pacific Northwest Region, Fire and Aviation Management (Producer). Available: http://www.fs.fed.us/r6/fire/fastracs [2009, January 21].

Van Cleve, R and R. Ting. 1960. The Condition of Salmon Stocks in the John Day, Umatilla, Walla Walla, Grande Ronde, and Imnaha Rivers As Reported By Various Fisheries Agencies. Department of Oceanography University of Washington. Seattle, WA

Williams, E.S. and I.K. Barker, 2000. Infectious Diseases of Wild Mammals. Iowa State University Press. Ames. IA.

Wisdom, M.J., R. S. Holthausen, B. C. Wales, C. D. Hargis, V. A. Saab, D. C. Lee, W. J. Hann, T. D. Rich, M. M. Rowland, W. J. Murphy, and M. R. Eames. 2000. Source Habitats for Terrestrial Vertebrates of Focus in the Interior Columbia Basin: Broad-Scale Trends and Management Implications. USDA Forest Service Pacific Northwest Research Station Gen. Tech. Rep. PNW-GTR-485. Portland, OR.

Zouhar, K. 2001. Abies concolor. In: Fire Effects Information System, [Online]. USDA Forest Service Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: http://www.fs.fed.us/database/feis/ [2008, November 10].

[This page left intentionally blank]

GLOSSARY

A

Adaptive Management

A type of natural resource management in which decisions are made as part of an ongoing process. Adaptive management involves implementing, monitoring, and evaluating management approaches. Results are used to modify future management approaches incorporating new knowledge based on scientific findings.

Allotted Trust Land

Land where the legal title is held by the United States and the beneficial or equitable title is held by an individual Indian allottee or his or her heirs.

Anadromous Fish

Fish that hatch and rear in freshwater, migrate to the ocean to grow and mature, and migrate back to freshwater to spawn.

B

Basal Area

The cross-sectional area of a single tree stem including the bark measured at breast height (4½ feet above the ground); also the cross-sectional area of all stems in a stand and expressed per acre.

Beneficiary

The recipient for whose benefit property is held in trust.

Biological Diversity

The variety and variability among living organisms and the ecological complexes in which they occur.

Board Foot

The amount of wood contained in an unfinished board 1 inch thick, 12 inches long, and 12 inches wide.

C

Canopy Closure

The amount of ground surface shaded by tree canopies as seen from above. Used to describe how open or dense a stand of trees is, often expressed in 10 percent increments.

Clearcutting

A regeneration harvest method that removes all merchantable trees in a single cutting except for wildlife trees or snags. A clearcut is an area from which all merchantable trees have been cut.

Climax Plant Association

Plant communities with similar form, structure, and composition that in the absence of high severity disturbance have reached a highly stable condition and undergo change very slowly.

Colluvium

Soil material and/or rock fragments moved by creep, slide, or local wash and deposited at the base of steep slopes.

Cumulative Effects

Impacts on the environment that result from the incremental impact of an action when added to other past, present, and reasonably foreseeable future actions.

D

Diameter Breast High (DBH)

The standard diameter measurement for trees including bark taken at 4½ feet above the ground.

Direct Effects

Impacts on the environment that are caused by the action and occur at the same time and place.

Disturbance

Refers to events that alter the structure, composition, or function of terrestrial or aquatic habitats.

Duff

The partially decomposed organic material of the forest floor that lies beneath freshly fallen needles, bark, twigs, and stems.

E

Ecosystem

A complete interacting system of living organisms and the physical environment in which they reside.

Endangered Species

A fish, wildlife or plant species officially designated by NOAA Fisheries or the U.S. Fish and Wildlife Service as having its existence endangered over its entire range because its habitat is threatened with destruction, drastic modification, or severe curtailment or because of overexploitation, disease, predation, or other factors.

Even-Aged Management

Method of forest management in which trees are maintained at about the same age and size and are harvested all at once so a new stand may grow.

F

Fire Intensity

The heat released per unit of time for each unit of length of the leading fire edge expressed as British thermal units (Btu) per foot of fire line per second or as kilowatts (kW) per meter of fire line per second.

Fire Regime

The characteristics of fire in a given ecosystem such as frequency of reoccurrence, intensity, and severity.

Fire Severity

Qualitative description of the effect of the heat pulse during a fire on the ecosystem.

Floodplain

Relatively level areas next to rivers or streams which are covered with water when the river or stream overflows its banks.

Forest Health

The condition in which forest ecosystems sustain their complexity, diversity, and productivity and exhibit resiliency to disturbances.

Fuel Ladder

Vegetative structures or conditions such as low growing tree branches, shrubs, or smaller trees that allow fire to move vertically from a surface fire to a crown fire.

Fuel Load

The dry weight of combustible materials per unit area usually expressed as tons per acre.

G

Guideline

An action, priority, process, or prescription that may be useful in meeting management objectives.

H

Habitat Type

An aggregation of all land areas capable of supporting similar plant communities at climax.

Historic Range of Variability (HRV)

The natural fluctuation of ecological and physical processes and functions that likely occurred prior to European settlement.

Hydrologic Unit Code (HUC)

A hierarchical coding system developed by the U.S. Geological Survey to identify geographic boundaries of watersheds of various sizes.

I

Indirect Effects

Impacts on the environment that are caused by an action and are later in time or further removed in distance but are still reasonably foreseeable.

Irretrievable Commitment

The lost production or use of renewable resources such as timber, forage, or wildlife habitat.

Irreversible Commitment

The use of non-renewable resources such as fossil fuels, cultural resources, and/or the conversion of land from one use to other uses.

Issue

A matter of controversy, dispute, or general concern over resource management activities or land uses.

L

Large Woody Debris

Pieces of woody material on the ground derived from tree limbs and boles in various stages of decay generally having a minimum diameter of 12 inches at the small end and a minimum length of 5 feet in dry and moist forests and a minimum diameter of 8 inches at the small end and a minimum length of 8 feet in cold forests.

Litter

The uppermost layer of organic debris on the soil surface; essentially freshly fallen or slightly decomposed needles, twigs, and stems.

Loess

Fine grained material dominantly of silt sized particles deposited by wind.

Long Term Sustained Yield

The yield of wood fiber that a forest can produce continuously from a given intensity of management; a balance between growth and removal by harvest.

Lower Limit of the Management Zone (LLMZ)

A stocking level objective used to establish the lower limit of a management zone set at 67 percent of the upper limit of a management zone for a given tree species-plant association combination (Powell 1999)

M

Management Zone

A stocking level zone established by setting upper and lower limits. The upper limit is set to avoid competition induced mortality. The lower limit is set to maintain sufficient trees to allow a significant portion of the site's resources to be captured for growth (Powell 1999),

Marginal Cover for Deer and Elk

Any stand of coniferous trees 40 feet or more tall with an average canopy closure between 40 and 69 percent.

Mastication

A mechanical grinding or mulching process in which slash or other forest fuels are treated to reduce fire hazard.

N

Net Present Value

The difference between the sum of the income from the harvest of timber over time and the sum of the management costs over time where future values are discounted to the present.

.

Nitrogen Oxides

A group of highly reactive gases, all of which contain nitrogen and oxygen in varying amounts, produced from high temperature combustion of fossil fuels. Many of the nitrogen oxides are colorless and odorless.

O

Ozone

A toxic blue unstable gaseous form of oxygen with each molecule consisting of three atoms produced by electric discharge or exposure to ultraviolet light.

P

Palustrine

Pertaining to wet or marshy habitats.

Particulate Matter

Solid particles or liquid droplets suspended or carried in the air.

pH

A measure if the hydrogen ion active concentration in aqueous solutions ($ph = -\log_{10}(H^+)$). Acidic solutions have a pH less than 7, neutral solutions have a pH of 7 and basic solutions have a pH greater than 7.

Plant Association Group (PAG)

Groupings of plant associations representing similar ecological environments as characterized by temperature and moisture regimes. The Potential Association Group represents the lowest level in the mid-scale portion of a potential vegetation hierarchy for the Blue Mountains.

Plant Vegetation Group (PVG)

An aggregation of Plant Association Groups (PAGs) with similar environmental regimes and dominant plant species. The Potential Vegetation Group represents the middle level of the mid-scale portion of a potential vegetation hierarchy for the Blue Mountains.

$PM_{2.5}$

Particulate matter that measures 2.5 micrometers or less in diameter.

PM_{10}

Particulate matter that measures 10 micrometers or less in diameter.

Pre-commercial Thinning

The removal of trees to reduce stocking and thereby accelerate growth on the more desirable trees not for immediate financial gain.

Prescribed Fire

Fire used as a management tool under specified conditions for burning a defined area.

Primary Cavity Excavators

A species that digs or chips out cavities in wood to provide itself or its mate with a site for nesting or roosting.

Q

Quadratic Mean Diameter

The diameter corresponding to the mean basal area; the diameter of a tree of average basal area in a stand (Powell 1999).

R

Redd

Spawning nest made by a fish in the gravel bed of a river or stream.

Residuum

Unconsolidated weathered or partly weathered mineral material that accumulated as consolidated rock disintegrated in place**.**

Riparian Areas

Lands adjacent to creeks, streams, and rivers where the vegetation is strongly influenced by the presence of water.

Riparian Management Zone (RMZ)

An area of land on each side of a stream in width equal to 75 feet times the stream order in which management objectives are different from adjacent upland areas.

S

Satisfactory Cover for Deer and Elk

Any stand of coniferous trees 40 feet or more tall with an average canopy closure of 70 percent or greater.

Secondary Cavity User

A wildlife species that occupies a cavity in a snag that was excavated by another species.

Seral

Stages that plant communities go through during succession.

Shade Intolerant Plant Species

Species of plants that do not grow well or die from the effects of too much shade.

Shade Tolerant Plant Species

Species of plants that can develop and grow in the shade of other plants.

Silviculture

The art and science of manipulating the establishment, composition, structure, growth, and rate of plant succession to accomplish specific objectives.

Silvicultural Prescription

The decision to use one or more of a series of silvicultural treatments to produced a desired result in terms of stand composition and structure.

Snag

Any dead or partly dead tree at least 4 inches d.b.h. and at least 6 feet tall.

Stand

Vegetation occupying a specific area and sufficiently uniform in species composition, age structure, and condition as to be distinguished from the vegetation on adjoining areas.

Stand Density Index (SDI)

A widely used measure that expresses relative density as the relationship between a number of trees per acre and a stand's quadratic mean diameter.

Stream Morphology

The form and structure of streams.

Stream Order

A hydrologic system of stream classification in which each small unbranched tributary is a first order stream. A second order stream consists of two first order streams and so forth.

Succession

A predictable process of changes in the structure and composition of plant and animal communities over time.

T

Threatened Species

A fish, wildlife or plant species officially designated by NOAA Fisheries or the U.S. Fish and Wildlife Service as having its existence threatened in a localized area because its habitat is threatened with destruction, drastic modification, or severe curtailment or because of overexploitation, disease, predation, or other factors.

Total Maximum Daily Load (TMDL)

Written plans and analyses established to insure a water body will attain and maintain water quality standards.

Tribal Trust Land

Land where the legal title is held by the United States and the beneficial or equitable title is held by the Confederated Tribes of the Umatilla Indian Reservation.

Turbidity

The relative level that suspended matter interferes with the passage of light through water.

U

Upper Limit of the Management Zone (ULMZ)

A stocking level objective used to establish the upper limit of a management zone set at 75 percent of full stocking for each tree species except lodgepole pine and ponderosa pine. The ULMZ for lodgepole pine is based on an absolute threshold due to its susceptibility to mortality from the mountain pine beetle. UMLZ calculations for ponderosa pine are based on site quality information (Powell 1999).

V

Volatile Organic Chemicals

Chemicals of an organic nature (containing hydrogen, oxygen, and carbon) which readily volatilize or travel from the water into the air.

APPENDIX A
THE SPECTRUM MODEL

[This page left intentionally blank]

Appendix A
The Spectrum Model

Model Description

Conclusions regarding future forest conditions are based primarily on outputs from an inland Pacific Northwest variant of the *Stand Projection System (SPS)* (Arney 1985a; Arney 1985b) and the *Spectrum* model (Greer and Meneghin 2000; U.S. Forest Service 2002). Acres by stocking density class (SDI) and basal area class, timber inventory volume, harvested volume, number of acres treated, number of harvest entries, amount of wildlife thermal cover, amount of large woody debris, and acres with large size trees (>20" DBH) were the primary measures used to project future forest conditions with application of the silvicultural regimes.

SPS was developed and is supported by Mason, Bruce, & Girard Inc., a private consulting firm based in Portland, Oregon. The *Spectrum* Model was developed and is supported by the USDA-Forest Service for use in strategic forest planning. It enables the user to build resource allocation and harvest scheduling models. *Spectrum* uses linear programming based optimization techniques to analyze management alternatives.

Management Regimes

The following management regimes were applied in the planning model:

NSH Under this regime, timber harvest would not be scheduled (No Scheduled Harvest) in the inner 50% the riparian management zones. These stands will be examined on a case-by-case basis to determine if their condition warrants vegetation treatment to achieve riparian management objectives.

CC The Clearcut Regime applies to lodgepole pine stands. These stands generally do not lend themselves to multi-cohort management. Rotation length is 60-80 years.

ML20 This Multi-Cohort Regime focuses on producing larger trees and fewer small trees than MS20. Harvests are scheduled to occur every 20 years generally focusing on larger age classes. Foresters often use a "Q-Factor" to describe stand structure under uneven-aged management. The Q-Factor describes the number of trees in a size class relative to the next larger size class. Two inch classes are used to describe the structure. ML20 has a stand structure defined with a Q-Factor of 1.12. Trees are distributed between age classes such that the smaller size classes have just enough trees to grow into larger age classes.

MS20 This Multi-Cohort Regime stores more of the biomass in smaller trees. Harvests are also scheduled to occur every 20 years generally focusing on smaller diameter trees. MS20 has a stand structure defined by a Q-Factor of 1.3.

Growth And Yield Projections

SPS features an individual-tree distance-independent growth model developed in the late 1970's and early 1980's for tree species in the western U.S. It was designed to handle a broad array of species, regions, and silvicultural regimes, and has been commonly used to produce yield tables, update forest inventory estimates, and evaluate silvicultural alternatives. Tree growth and mortality estimates are affected by a combination of tree and stand density attributes, including age, crown ratio, relative tree size, and crown competition.

SPS is made up of five basic equations for each species:

1. Top height growth as a function of breast height age and site index.
2. Diameter breast height growth as a function of relative tree size, crown ratio, and crown competition factor (CCF).
3. Height growth as a function of relative height, crown ratio, and CCF.
4. Survival as a function of relative tree size, crown ratio, and CCF.
5. Tree volume as a function of height and diameter expressed as a taper equation.

Mortality in *SPS* is based on normal density-related mortality. *SPS* uses CCF as the measure of density that affects density-dependent mortality. *SPS* uses a mortality algorithm that depends on the level of CCF in a stand. No mortality occurs in stands with less than 100 CCF. Between 100 and 400 CCF, a non-linear equation predicts a maximum number of trees allowed at the next simulation step. The difference between the projected trees per acre and the current number of trees per acre is the number of trees to be killed. Half of the number of trees to be killed are arbitrarily removed from the first DBH size class, half of the remaining number from the next DBH size class, and so on until the number is reached. Large trees have very little chance of dying. *SPS* does not predict catastrophic mortality from insects and diseases.

Recent work for the Idaho Department of Lands indicated that *SPS* predicted actual growth on permanent plots as well or better than other growth models.

Other key assumptions and/or processes used in *SPS* to develop the yield tables for the UIR include:

- The *SPS* clumpiness factor was set to 0.60 for all stands. We found that this calibration provided yields that were within the range of growth reported for this area as reported in the Forest Inventory Analysis reports.

- The management regimes assumed adequate regeneration following each partial harvest. Trees assumed to survive fifteen years after the harvest were added to the stand tables to simulate regeneration.

- The growth model projects growth and mortality on the live trees from the inventory. Mortality in the model is primarily a function of stand density, and is derived from data from healthy stands of timber. Mortality on the UIR forest has been heavily influenced by insect epidemics, something that the model does not predict nor project. Overstocking has contributed to the infestation. As the UIR stands are managed, insect-related mortality is expected to decline. The growth model, however, does not account for existing insect levels. Differences between projected and actual growth will be accounted for in future updates of the Forest Management Plan.

- Harvest regimes reduced stocking in diameter classes to simulate harvest down to the stocking levels recommended by the U.S. Forest Service for timber stands in northeastern Oregon (Powell 1999). Within each diameter class, trees selected for harvest were based on preferred species and diameter.

- Stands were grouped into 30 different types based on species, size and stocking. For each type, projections were made for a variety of different management regimes. In total, 338 yield tables were prepared for the harvest scheduling model.

- The projections were made in ten year increments. At each cycle, the schedule and stand table were examined to determine whether a harvest is scheduled and whether there was enough volume to make an economically feasible harvest. If a feasible harvest entry could be scheduled, then some of the trees were marked as cut. Each yield projection consisted of a series of stand tables with tree records marked as cut or residual. The stand tables were summarized to give harvest and inventory by species, stand conditions, habitat parameters, etc.

- The 338 yields were checked to insure that they were reasonable projections. Any potential problems were resolved before sending the yield projections to the harvest scheduling model.

Harvest Scheduling

Harvest scheduling and calculation of the annual allowable cut (AAC) for the FMP was carried out using *Spectrum* modeling software. *Spectrum* is a linear programming based analytical tool designed to assist land managers with strategic planning decisions and analysis of alternatives. It can be used to conduct sensitivity analysis and evaluate the economics of forest management. *Spectrum* can be used to explore alternative pathways for achieving a specific desired condition. It can assist in developing feasible and sustainable management plans by scheduling activities subject to specific management objectives and constraints. Trade-offs among management alternatives can be explored in terms of ecological and economic factors.

The *Spectrum* model utilized for the Forest Management Plan consisted of 7 basic components:

1. Planning Horizon

Twelve ten-year periods were used to define a total planning horizon of 120 years.

2. Land Stratification

Forested acres on the UIR were stratified using seven different criteria. Acres with matching attributes across all seven criteria were grouped into Analysis Units (in *Spectrum* terminology). Analysis Units can be made up of one or several individual polygons. The seven classification criteria and resulting acres are defined below.

Subwatershed

The UIR is divided into a total of 94 individual subwatersheds. Of these, only 43 have forested acres that were carried forward into the *Spectrum* model. Of the 43 subwatersheds, only 40 subwatersheds contain allotted trust, Tribal trust, or Tribal fee forest lands. The amount of forest lands in each subwatershed range from 8 to 2,358 acres.

Ownership

Three ownership classes were recognized: Allotted trust, Tribal trust, and Tribal fee lands. Table A-1 presents a summary of forested acres by subwatershed and ownership class.

Road Status

Stands were classified in one of two ways relative to road status (Table A-2). Stands within one-quarter mile of a road deemed passable for the next ten years were considered available in decade one for harvest scheduling while stands outside of this buffer were considered unavailable in decade one, but could be scheduled for harvest in decade two and beyond.

Riparian Status

Acres were classified as floodplain; inner riparian; outer riparian; or uplands (non-riparian). Definitions follow those established in planning Standards. Table A-3 displays acres in each class. No harvest was scheduled within floodplain or inner riparian areas.

Species

Five species groups (Table A-4) were delineated based on the latest timber inventory. These include Douglas-fir; lodgepole pine; mixed conifer; pine mix; and ponderosa pine.

Structural Stage

Four structural stages (Table A-5) or size classes were represented, based on the latest timber inventory: Seedling/Sapling; Pole Timber (5-8.9” DBH); Small Sawtimber (9-20.9” DBH); and Large Sawtimber (21.0”+ DBH).

Table A-1. UIR Forested Acres By HUC And Ownership Class.

HUC No.	HUC Name	Allotted Trust	Tribal Trust	Tribal Fee	Total
3	Eagle Creek	501.1		65.9	567
6	Upper Spring Hollow	136.3			136.3
11	North Umatilla River	129.8	10.7		140.5
13	Saddle Hollow	35.9	3.9		39.8
16	Upper Umatilla River	129.1			129.1
23	Lower Meacham Creek	148.2		10.8	159
28	Red Elk Canyon	38			38
31	Buckaroo Creek	893.5	154	622	1,669.5
32	Meacham Creek	202.4	38.2	648.5	889.1
33	Boston Canyon	135.4		49	184.4
36	Coonskin Creek	123.5	25.3		148.8
42	Cottonwood Creek	191.3		35.2	226.5
51	Red Hawk Gulch	41.5			41.5
52	Upper North Coyote Creek	7.9			7.9
53	Isqúulktpe Creek	477.6	457.6	495.9	1,431.1
54	Little Isqúulktpe Creek	271.1	163.3	73.8	508.2
55	Deadman Pass Canyon	639.7	201.3	343.2	1,184.2
56	Lost Pin Creek	400.1	32.8	196.9	629.8
58	Darr Creek		39.8		39.8
59	Upper Meacham Creek		145.6		145.6
63	Little McKay Creek	29.2			29.2
66	Denson Canyon	9.8			9.8
68	Beaver Creek		392.6		392.6
71	McKay Creek		1,557.4		1,557.4
72	Wood Hollow		19.1		19.1
73	Bassey Creek		150.9		150.9
74	Snipe Creek		72		72
75	Little Johnson Creek		1,092.3		1,092.3
76	Big Johnson Creek		2,357.9		2,357.9
77	East Birch Creek		227		227
78	Jenning's Creek		2,237.7		2,237.7
79	McCoy Creek		341.4		341.4
81	Wild Horse Mountain	189.8	18.2		208
83	Bachelor Canyon	1,044.3	37.6	961.3	2,043.2
87	Moonshine Creek	412.6		35.7	448.3
88	Bell Cow Creek		78		78
89	Table Rock	66.4	4.5	88	158.9
90	Red Spring		19.5		19.5
92	Mainstem Umatilla River	102.3			102.3
94	Mission Creek	127.8	14.8		142.6
Total		6,484.6	9,893.4	3,626.2	20,004.2

Table A-2. UIR Forested Acres By Road Status And Ownership Class.

Road Status	Allotted Trust	Tribal Trust	Tribal Fee	Total
Available decade 1+	3,849.7	4,588.0	3,004.4	11,442.1
Available decades 2+	2,634.9	5,305.4	621.8	8,562.1
Total	6,484.6	9,893.4	3,626.2	20,004.2

Table A-3. UIR Forested Acres By Riparian Status And Ownership Class.

Status	Allotted Trust	Tribal Trust	Tribal Fee	Total
Floodplain	50.8	116.4	83.9	251.1
Inner Riparian	599.1	923.3	661	2,183.4
Outer Riparian	538.2	844.6	586.9	1,969.7
Uplands	5,296.5	8,009.1	2,294.4	15,600.0
Total	6,484.6	9,893.4	3,626.2	20,004.2

Table A-4. UIR Forested Acres By Species Group And Ownership Class.

Species Group	Allotted Trust	Tribal Trust	Tribal Fee	Total
Douglas-fir	285.4	148.8	243.5	677.7
Lodgepole Pine		215.8		215.8
Mixed Conifer	2,035.9	5,958.9	1,679.3	9,674.1
Pine Mix	1,440.7	2,456.2	804.7	4,701.6
Ponderosa Pine	2,722.6	1,113.7	898.7	4735
Total	6,484.6	9,893.4	3,626.2	20,004.2

Table A-5. UIR Forested Acres By Size Class And Ownership Class.

Size Class	Allotted Trust	Tribal Trust	Tribal Fee	Total
Seeding/Sapling	681.3	96.6	86.4	864.3
Poles	769.2	412.3	558	1,739.5
Small Sawtimber	3,867.3	7637	2,465.2	13,969.5
Large Sawtimber	1,166.8	1,747.5	516.6	3,430.9
Total	6,484.6	9,893.4	3,626.2	20,004.2

Stocking Density

Three density classes were recognized (Table A-6). Low density consists of open cover, poorly stocked stands with 10-39% crown closure. Medium density stands are patchy cover with medium stocking and 40-69% crown closure. High density stands are closed cover, well stocked stands with 70%+ crown closure.

Table A-6. UIR Forested Acres By Density Class And Ownership Class.

Density	Allotted Trust	Tribal Trust	Tribal Fee	Total
Low	1,497.7	3,315.9	848.4	5,662.0
Medium	2,265.4	3,986.0	1,476.1	7,727.5
High	2,721.5	2,591.5	1,301.7	6,614.7
Total	6,484.6	9,893.4	3,626.2	20,004.2

3. Management Actions

Management Actions are the regimes that can be applied to different types of acres. Four types of Management Actions were modeled: No Scheduled Harvest (NSH); Clearcut (CC); and two Multi-Cohort Management regimes (ML20 and MS20). All acres were allowed the NSH regime as a choice in order to evaluate the economic efficiency of management within the alternatives (Table A-7). Lodgepole pine also received the CC regime as an option. Other stand types received both of the multi-cohort options.

Table A-7. Management Actions by Alternative.

Land Class	Alt A	Alt B1	Alt B2	Alt B3
Private Lands	NSH	NSH	NSH	NSH
Floodplain, Inner Riparian	NSH	NSH	NSH	NSH
Lodgepole	NSH	NSH, CC	NSH, CC	NSH, CC
Isqúulktpe Creek	NSH	NSH, ML20, MS20	NSH, ML20, MS20	NSH, ML20, MS20
Big Johnson Creek	NSH	NSH, ML20, MS20	NSH, ML20, MS20	NSH
Everything Else	NSH	NSH, ML20, MS20	NSH, ML20, MS20	NSH, ML20, MS20

4. Activities/Outputs/Conditions

In general, activities have associated costs, outputs have associated values, and conditions have neither. A condition usually reflects an ecological attribute of interest. Table A-8 lists activities, outputs, and conditions (A/O/C) tracked in the UIR *Spectrum* model.

Table A-8. Activities, Outputs, And Conditions In The UIR *Spectrum* Model.

A/O/C Code	Units	Economics	Definition
SitePrep	Acres	Y	Site preparation
Plant	Acres	Y	Planting
PCT	Acres	Y	Pre-commercial thinning
Logging	MBF	Y	Logging cost
Haul	MBF	Y	Haul cost
Mgmt	Acres	Y	Land management cost
DF	MBF	Y	Douglas-fir volume harvested
GF	MBF	Y	Grand fir volume harvested
LP	MBF	Y	Lodgepole volume harvested
OC	MBF	Y	Other conifer volume harvested
PP	MBF	Y	Ponderosa pine volume harvested
WL	MBF	Y	Western larch volume harvested
Managed	Acres	N	Acres scheduled for harvest
Unmanaged	Acres	N	Acres not scheduled for harvest
SatCover	Acres	N	Satisfactory thermal cover
MargCover	Acres	N	Marginal or better thermal cover
Struct1	Acres	N	Seedling/sapling size class
Struct2	Acres	N	Pole timber size class
Struct3	Acres	N	Small sawtimber size class
Struct4	Acres	N	Large sawtimber size class
Dense1	Acres	N	Low density stock class
Dense2	Acres	N	Medium density stocking class
Dense3	Acres	N	High density stocking class
StockHi	Acres	N	Acres of high fire risk
StockHi2	Acres	N	Acres of high insect & disease risk
Above	Acres	N	Acres above SDI stocking guidelines
Below	Acres	N	Acres below SDI stocking guidelines
Within	Acres	N	Acres within SDI stocking guidelines
Entry1	Acres	N	First commercial thinning entry
Entry2	Acres	N	Second commercial thinning entry
Entry3	Acres	N	Third commercial thinning entry
Entry4	Acres	N	Fourth commercial thinning entry
Entry5	Acres	N	Fifth commercial thinning entry
Entry6	Acres	N	Sixth commercial thinning entry
LargeTree	Acres	N	Acres with 10+ trees 21”+ DBH
LWD	Acres	N	Acres with large woody debris
INV	MBF	N	Inventory volume
LTSY	MBF	N	Long-term sustained yield

5. Costs and Values

Regional average prices and costs were estimated for the UIR in the absence of recent historical data (Table A-9) (Table A-10).

Table A-9. Timber Prices Used In The UIR Model.

Timber Product Group	Value per MBF
Douglas-fir	$450
Grand Fir	$450
Lodgepole Pine	$350
Other Conifer	$350
Ponderosa Pine <12" DBH	$350
Ponderosa Pine >12" DBH	$500
Western Larch	$450

Table A-10. Costs Used In The UIR Model.

Management Activity	Cost and Units	Factor
Site Preparation (thin)	$30 per acre	x 0.05 per acre thinned
Site Preparation (CC)	$30 per acre	x 1 per acre clearcut
Planting (thin)	$300 per acre	x 0.05 per acre thinned
Planting (CC)	$300 per acre	x 1 per acre clearcut
Pre-Commercial Thinning	$150 per acre	x 0.1 per acre thinned
Haul	$30 per MBF	x Volume harvested
Logging (CC)	$150 per MBF	x Clearcut volume
Logging (thin)	$180 per MBF	x Thinned volume
Logging (roadless)	$400 per MBF	x Roadless volume
Land Management	$15 per acre/year	x All forested acres

6. Constraints

Two main types of constraints were used. The first constraint limited harvest in the first 10 years to stands that were within one-quarter mile of a passable road. Passable roads were defined as those not in need of reconstruction for use as haul roads over the next ten years. The second type of constraint was used to control timber harvest flow over time. The constraint did not allow harvest to decline between decades but did allow harvest to increase by a maximum of 20% from decade to decade. Flow constraints were applied separately and independently to both trust lands and fee lands.

7. Objective Functions

In linear programming, an objective function represents the parameter being optimized over time. For example, desired wildlife cover conditions could be maximized or sedimentation could be minimized. Numerous objective functions were tested and used for the UIR model:

- Maximize Net Present Value (NPV) over 12 decades
- Maximize timber production in decade 1
- Maximize timber production over 12 decades
- Minimize the number of acres above SDI stocking guidelines in decade 1
- Minimize the number of acres above SDI stocking guidelines in decades 1 and 2
- Minimize the number of acres above SDI stocking guidelines over 12 decades
- Maximize the number of acres within SDI stocking guidelines, as above

NPV is the periodic value of all revenues, minus all costs, discounted to the present. A 4% annual discount rate was employed with this objective function.

Stand density index (SDI) is used on a per acre basis as a measure of forest health. Stands that fall within SDI guidelines are deemed to be within the desired future condition described for healthy forest stands on the UIR. By minimizing the number of acres above the SDI guidelines, the number of forest acres where stand density is high enough to be considered at higher risk for insect and disease infestation is minimized. The same management objective can be modeled by maximizing the number of acres that are within the SDI guidelines.

Sensitivity analysis using a number of different objective functions provided insight into deriving useful solutions for the selected management strategy as well as for comparison purposes to the no management strategy. The IDT determined that using multiple objective functions, sequentially, provided the best representation of the management intent of each alternative. This involved solving the UIR *Spectrum* model first with one objective function, using constraints to set the relevant parameters of that solution, and then re-solving the model with a subsequent objective function.

The following sequence of objective functions were utilized in the *Spectrum* model: first, the number of acres above SDI guidelines in decades one and two were minimized; secondly, the number of acres above SDI guidelines in decades one through twelve were minimized; and finally, NPV in decades one through twelve was maximized. The resultant harvest schedule approximates the most efficient management strategy for improving forest health in the short-term and the long-term.

The *Spectrum* model used in this analysis, like all models, is a simplification of reality. It fails to accommodate all of the interactions inherent in complex biological, physical, and economic systems. Consequently, the monitoring and evaluation plan designed for the FMP includes the monitoring of key assumptions included in the modeling, such as costs, values, growth rates, etc.

Appendix B

Outputs From The Spectrum Model

[This page left intentionally blank]

Table B-1. Summary of Net Present Value, Acres Under Management, And Annual Allowable Cut For The Selected Management Strategy.

Alternative B2		1	2	3	4	5	6	7	8	9	10	11	12
Net Present Value ($)	$4,228,000												
Modeled Acres	20,004												
Acres under Management	14,765												
Average Annual Cut Decades 1-12 (MMBF/YR)	3.242												
Harvest from Allotted Trust Lands (MBF/Decade)		6,479	8,706	8,438	9,710	10,587	11,944	11,915	13,312	11,883	12,844	16,029	14,598
Harvest from Tribal Trust Lands (MBF/Decade)		7,291	7,817	9,995	12,409	15,956	19,908	23,782	22,386	23,815	22,853	19,669	21,100
Harvest from Tribal Fee Lands (MBF/Decade)		1,639	1,967	2,361	2,833	3,399	4,079	4,884	4,884	4,884	4,884	4,884	4,884
Total Harvest (MBF/Decade)		15,409	18,490	20,794	24,952	29,942	35,931	40,581	40,582	40,582	40,581	40,582	40,582
Harvest Acres Per Decade		4,883	4,554	6,970	6,770	7,086	6,795	7,410	6,875	7,670	7,078	7,687	6,886
Average MBF/Acre Removed		3.156	4.060	2.983	3.686	4.226	5.288	5.477	5.903	5.291	5.734	5.279	5.893

Table B-2. Summary of Total Inventory, Managed Inventory, And Acres Above SDI Guidelines By Decade

		1	2	3	4	5	6	7	8	9	10	11	12
Total Inventory (MBF)		277694	309261	341308	369721	392714	413907	425781	433700	437847	445218	445920	446226
Average Total Inventory (MBF/Acre)		13.882	15.460	17.062	18.482	19.632	20.691	21.285	21.681	21.888	22.256	22.292	22.307
Inventory On Managed Lands (MBF)		188272	207620	230452	254704	273806	291944	301509	307622	310992	317805	318090	317879
Average Inventory On Managed Lands (MBF/Acre)		12.751	14.062	15.608	17.251	18.544	19.773	20.421	20.835	21.063	21.524	21.524	21.529
Total Acres Above SDI Guidelines		6,289	9,284	7,744	8,304	9,154	9,012	8,732	7,266	6,533	5,367	5,175	5,158
Managed Acres Above SDI Guidelines		3,531	5,074	3,166	3,384	4,122	3,873	3,593	2,108	1,375	209	17	0
Managed Douglas-Fir Acres Above SDI Guidelines		451	346	74	234	113	234	113	0	0	0	0	0
Managed Lodgepole Pine Acres Above SDI Guidelines		209	91	91	135	135	192	192	209	209	209	17	0
Managed Mixed Conifer Acres Above SDI Guidelines		1,203	3,465	2,266	1,836	1,718	2,249	1,614	752	484	0	0	0
Managed Pine Mixed Acres Above SDI Guidelines		1,322	993	684	1,076	1,913	485	1,430	485	682	0	0	0
Managed Ponderosa Pine Acres Above SDI Guidelines		347	179	51	103	244	713	244	662	0	0	0	0

Table B-3. Summary of Total Inventory By Species Group By Decade.

Decade		1	2	3	4	5	6	7	8	9	10	11	12
Total Inventory By Species Group	Species												
	DF	125,552	136,130	145,928	155,279	162,318	169,132	170,912	169,693	168,079	166,74	162,558	160,285
	GF	41,921	50,608	58,276	65,765	70,224	75,674	77,990	80,685	80,692	83,441	83,291	85,359
	LP	628	1,158	1,886	3,117	3,837	5,746	7,622	9,044	11,474	13,860	16,050	17,654
	OC	1,929	2,095	2,527	2,734	3,002	3,263	3,417	3,764	3,887	4,433	4,902	5,293
	PP	97,027	108,440	121,048	130,212	139,965	145,543	150,312	153,867	155,018	155,96	156,199	152,131
	WL	10,636	10,830	11,643	12,614	13,369	14,548	15,527	16,647	18,697	20,783	22,920	25,504
	Total	277,693	309,261	341,308	369,721	392,715	413,906	425,780	433,700	437,847	445,21	445,920	446,226
% Total Inventory By Species Group	Species												
	DF	45%	44%	43%	42%	41%	41%	40%	39%	38%	37%	36%	36%
	GF	15%	16%	17%	18%	18%	18%	18%	19%	18%	19%	19%	19%
	LP	0%	0%	1%	1%	1%	1%	2%	2%	3%	3%	4%	4%
	OC	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
	PP	35%	35%	35%	35%	36%	35%	35%	35%	35%	35%	35%	34%
	WL	4%	4%	3%	3%	3%	4%	4%	4%	4%	5%	5%	6%
	Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Table B-4. Summary of Managed Inventory By Species Group By Decade.

Decade		1	2	3	4	5	6	7	8	9	10	11	12
Managed Inventory By Species Group	Species												
	DF	80,117	85,850	92,053	99,888	105,522	111,214	112,267	110,325	108,386	106,84	102,483	100,017
	GF	27,326	32,127	36,918	43,361	46,812	51,498	53,262	55,764	55,771	58,519	58,370	60,438
	LP	460	862	1,534	2,760	3,477	5,380	7,256	8,676	11,106	13,491	15,682	17,286
	OC	1,199	1,263	1,537	1,737	1,999	2,253	2,401	2,745	2,868	3,414	3,883	4,274
	PP	71,948	80,272	90,378	98,001	106,350	110,812	114,593	117,270	117,982	118,57	118,570	114,178
	WL	7,223	7,246	8,031	8,957	9,646	10,787	11,731	12,842	14,879	16,965	19,102	21,687
	Total	188,273	207,620	230,451	254,704	273,806	291,944	301,510	307,622	310,992	317,80	318,090	317,880
% Managed Inventory By Species Group	Species												
	DF	43%	41%	40%	39%	39%	38%	37%	36%	35%	34%	32%	31%
	GF	15%	15%	16%	17%	17%	18%	18%	18%	18%	18%	18%	19%
	LP	0%	0%	1%	1%	1%	2%	2%	3%	4%	4%	5%	5%
	OC	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
	PP	38%	39%	39%	38%	39%	38%	38%	38%	38%	37%	37%	36%
	WL	4%	3%	3%	4%	4%	4%	4%	4%	5%	5%	6%	7%
	Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Table B-5. Number of Acres Harvested By Number Of Entries By Alternative.

Decade	1	2	3	4	5	6	7	8	9	10	11	12
1 Time	4,765	9,320	6,995	4,656	3,371	1,234	207	165	36	0	0	0
2 Times	0	0	4,676	9,231	6,393	4,055	3,243	1,106	207	165	36	0
3 Times	0	0	0	0	4,676	9,231	6,526	4,187	3,243	1,106	207	165
4 Times	0	0	0	0	0	0	4,544	9,099	6,526	4,187	3,243	1,106
5 Times	0	0	0	0	0	0	0	0	4,544	9,099	6,526	4,187
6 Times	0	0	0	0	0	0	0	0	0	0	4,544	9,099

Table B-6. Acres Of Marginal And Satisfactory Thermal Cover By Decade

Decade	1	2	3	4	5	6	7	8	9	10	11	12
Marginal Cover	6,458	6,987	5,357	4,403	3,749	3,734	4,712	4,949	4,887	5,459	5,946	6,675
Satisfactory Cover	11,157	11,176	12,774	13,829	14,531	14,616	13,650	13,415	13,477	12,905	12,418	11,689
Total Cover	17,615	18,163	18,131	18,232	18,280	18,350	18,362	18,364	18,364	18,364	18,364	18,364

Table B-7. Acres Meeting Large Woody Debris Standard.

Decade	1	2	3	4	5	6	7	8	9	10	11	12
Acres	19,140	19,325	19,937	20,004	20,004	20,004	20,004	20,004	20,004	20,004	20,004	20,004

Table B-8. Acres With Ten Or More 21 Inch DBH Trees Per Acre.

Decade	1	2	3	4	5	6	7	8	9	10	11	12
Acres	8,401	10,602	13,759	15,242	16,062	17,487	18,066	18,532	19,439	19,092	19,860	19,631